DECEMBER
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FOUNDRY

A PENTON PUBLICATION

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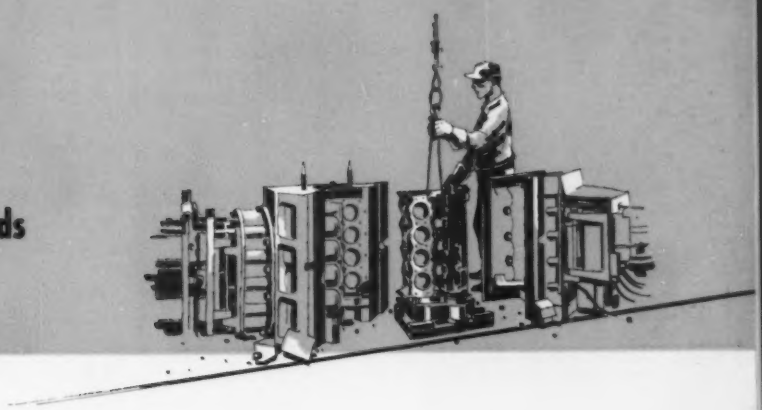

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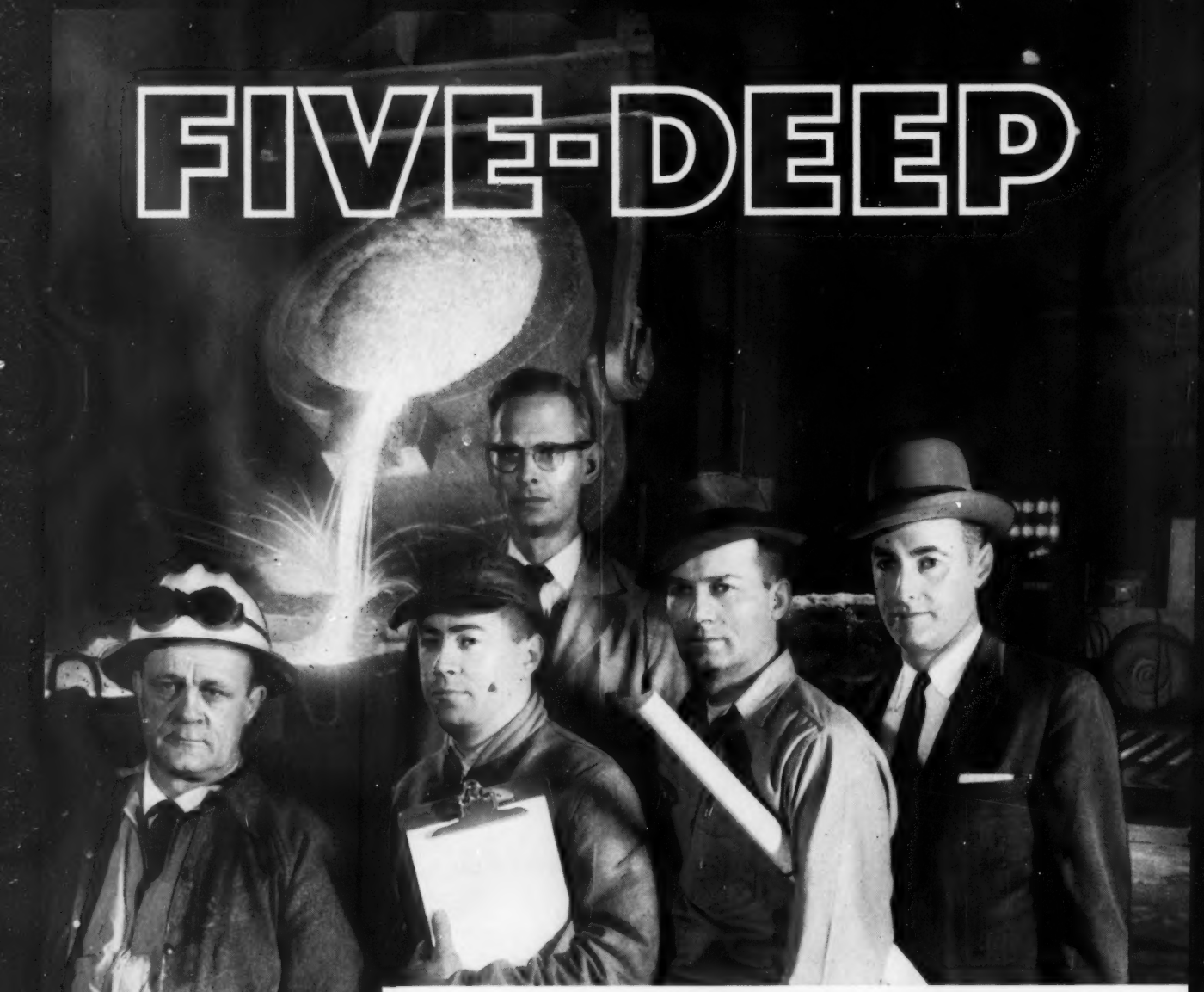

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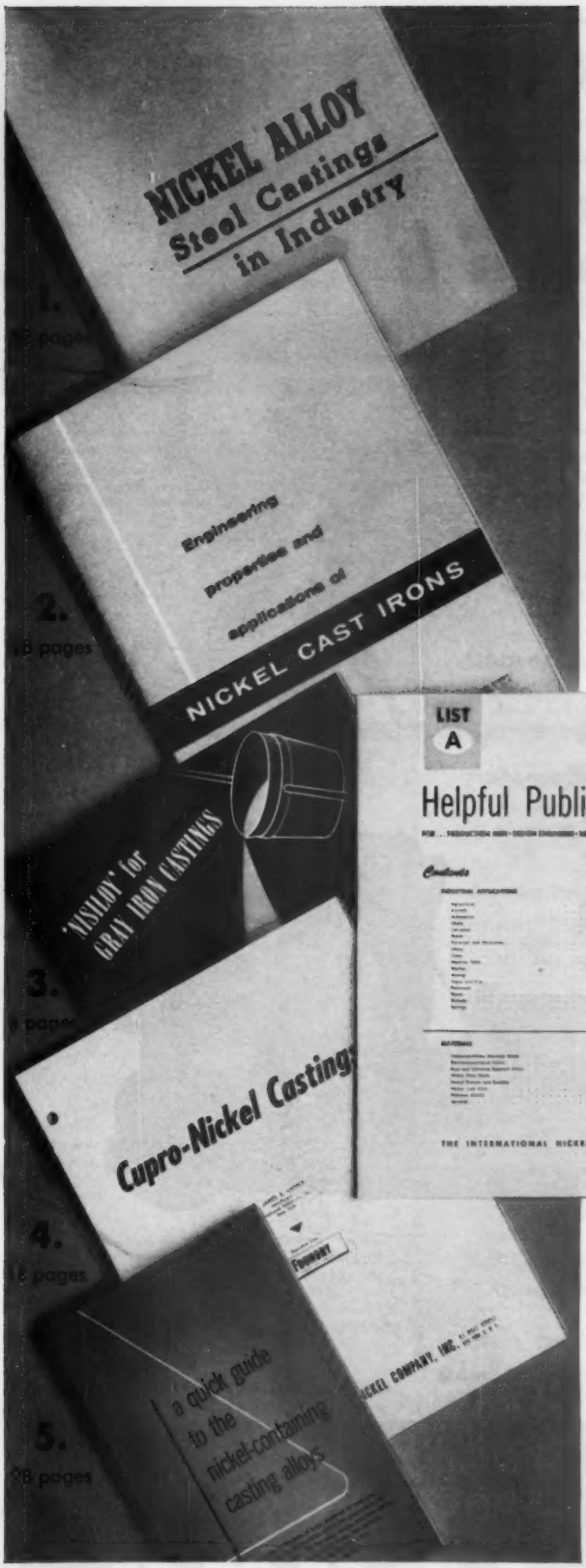

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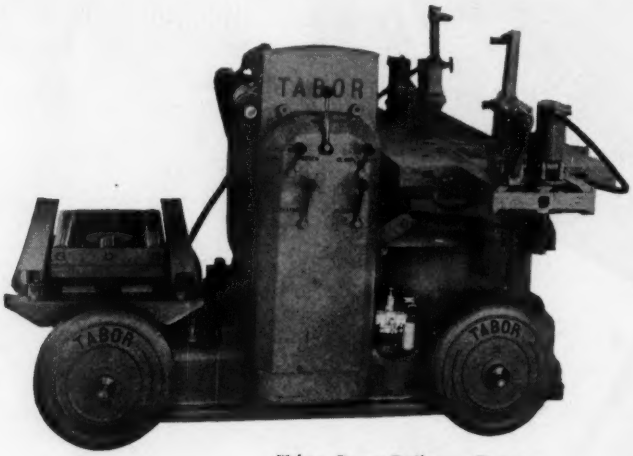

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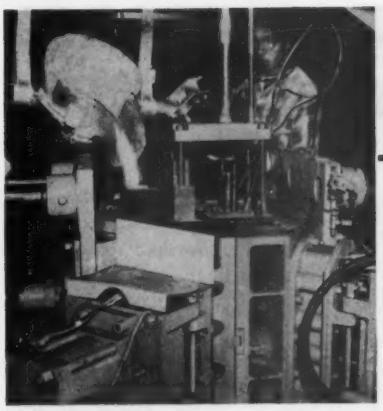

Aluminum blocks and heads for the V-8 engine of General Motors' new compacts are poured in permanent molds. About 72 per cent of the engine's weight is accounted for by 122 lb of iron castings, 107 lb of cast aluminum.

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FOUNDRY is edited primarily for management, production, technical, and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve all key foundry personnel on a personal or routed basis. A limited number of copies is supplied at no cost to educational institutions. Subscriptions in the U. S., possessions, and Canada for home-addressed copies and copies not qualified for under the above principles: One year, $10. Single copy, $1. Other countries: One year, $20. Single copy, $2. Published monthly by The Penton Publishing Co., Penton Building, Cleveland 13, Ohio. Accepted as controlled circulation publication at Cleveland, Ohio.

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THE EDITORS' WORKSHOP

THE FUTURE: What developments in foundry technology and education can foundrymen reasonably expect in the near future? A score of recognized authorities engaged in research work have given FOUNDRY their ideas on that question. Their views are consolidated in a thought-provoking article to be presented in the January issue.

HANDLING: Few foundries make as extensive use of magnets and cranes in handling foundry materials as does the I. F. Mfg. Co.,

New Philadelphia, Ohio. Its operations in the melting, cleaning, and annealing departments will be described next month.

CASTING YIELD: A technological breakthrough in an investment casting foundry provides a yield on investment castings as great as four times that previously obtainable. A new type sprue makes the improvement possible. See January issue.

STATUARY: Sculptor Art Price of Canada has been successful with an unconventional method for making

statuary. He sculptures by carving directly in the molding and core sands which later form the metal figure. Watch for details shortly.

She gets the job done, but...

Yes, the operator with exceptional drive can hunt-and-peck a lot of words out of an old typewriter. By the same principle, a *good* man can stay in business for years with an obsolete foundry.

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Logan Plant Dynamation design helps you harness all the work-power of your plant

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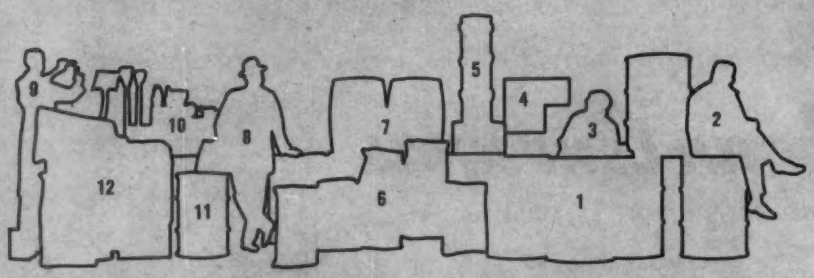

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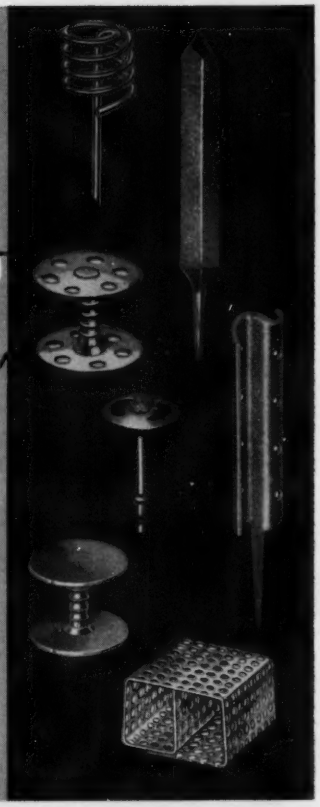

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Fluid Power news

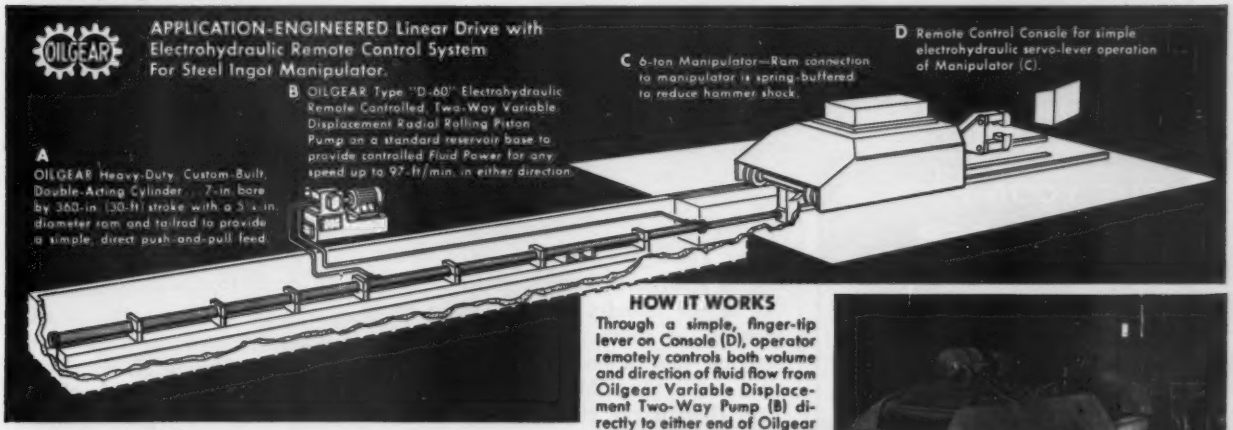
REPORT NO. 11,801 REMOTE CONTROLLED INGOT MANIPULATOR

From Oilgear *Application-Engineering* Files

HOW OILGEAR DRIVE SYSTEM ON INGOT MANIPULATOR IMPROVES CONTROL—CUTS DOWNTIME

DATA: Replace an electric variable speed drive on a 6-ton ingot manipulator because of excessive maintenance downtime, high rebuilding and replacement costs. Initial replacement plans called for a hydraulic variable speed drive directly to manipulator wheels, retaining customary practice of operators riding on manipulator. A job study revealed that while feeding an ingot under the open frame steam hammer, forward motion is momentarily stopped by each hammer impact—frequently bouncing manipulator wheels in the air, causing traction, speed control, shock, and operator fatigue problems.

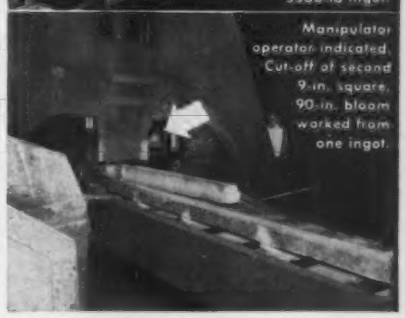
Basic Manipulator Drive Requirements were re-evaluated as follows: 1. Remove drive from manipulator to reduce shock-provoked maintenance downtime. **2.** Drive to be independent of wheel traction to improve feed and control. **3.** Provide stepless, remote speed control from zero to maximum in both directions. **4.** Withstand severe shock, vibration, heat, and dust on a continuous 16-hour day basis. **5.** Reduce operating, maintenance, and installation costs. **6.** Provide for future incorporation of hammer control with remote manipulator console.


APPLICATION-ENGINEERED Linear Drive with Electrohydraulic Remote Control System For Steel Ingot Manipulator.
A OILGEAR Heavy-Duty, Custom-Built, Double-Acting Cylinder . . . 7-in. bore by 360-in. (30-ft) stroke with a 5"-in. diameter ram and tailrod to provide a simple, direct push-and-pull feed.
B OILGEAR Type "D-60" Electrohydraulic Remote Controlled, Two-Way Variable Displacement Radial Rolling Piston Pump on a standard reservoir base to provide controlled Fluid Power for any speed up to 97-ft/min. in either direction.
C 6-ton Manipulator—Ram connection to manipulator is spring-buffered to reduce hammer shock.
D Remote Control Console for simple electrohydraulic servo-lever operation of Manipulator (C).

HOW IT WORKS

Through a simple, finger-tip lever on Console (D), operator remotely controls both volume and direction of fluid flow from Oilgear Variable Displacement Two-Way Pump (B) directly to either end of Oilgear Custom Cylinder (A). Only two pipe lines are required. Power input is used only in proportion to work performed, as no pump output power is wasted in direction control valves, external relief valves, flow control valves, auxiliary components, or excessive piping. Stepless, infinitely variable, smooth, steady manipulator speeds are instantly available in either direction. Fluid flow and pressure decelerate to zero as flow direction is changed—flow and pressure then accelerate to any selected amount in the new direction . . . reversal is smooth-cushioned — shock is eliminated. Controlled acceleration and deceleration; hydrodynamic braking; automatic pressure and flood lubrication; continuous filtration of power fluid . . . all are inherent features of Oilgear "Any-Speed" Drive Systems.

Hammer operator indicated. Oilgear-powered Manipulator with 5300-lb ingot.


Manipulator operator indicated. Cut-off of second 9-in. square, 90-in. bloom worked from one ingot.

SOLUTION: An Oilgear Linear Drive and Electrohydraulic Control System as shown above schematically. This departure from customary manipulator drives has proved—*in over two years of operation*—to have the following advantages: **1.** Lower operating costs . . . previous manipulator averaged 12% to 15% downtime every 16-hour day for repair and adjustment of drive and control components. **2.** Direct push and pull linear drive is a more positive, smoother, shockless feed—NOT affected by variations in wheel traction. **3.** Remote console with simple electrohydraulic servo control eliminates operator discomfort and fatigue. **4.** Cylinder is protected below floor—"Power-Pak" is mounted away from heat and dust of work area. **5.** Constant, automatic overload protection insures longer life, prevents damage.

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PQ SOLUBLE SILICATES

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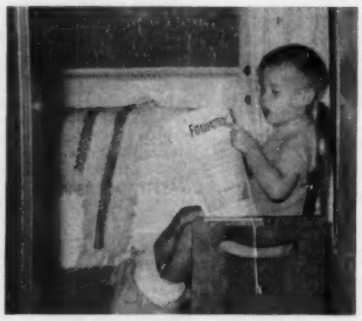
Circle 559 on Page 55

With the Editors

DIE CASTING FIRST: Early in November I enjoyed a visit to the first Die Casting Exposition and Congress held in Detroit under auspices of the Society of Die Casting Engineers. Although the show was not large in comparison with some of the industrial shows in the metalworking field, its size was most acceptable for a first-time exposition. Displays were excellent and represented many of the machines and materials employed in the diecasting industry. Attendance was good and of a high type. Conversation with exhibitors indicated considerable satisfaction with the results of the affair. FOUNDRY was pleased to have had a booth at the show.

Congratulations to those who staged this fine show.

Get Them Young: Early education of youngsters in the opportunities of the foundry appears to be growing, as shown in the accompanying illustration. As you can well see, young Michigan reader Tom Hemingway gives close attention to activities in the foundry field as delineated in a well-known business publication. His father, Bob, is production manager, General Foundry & Mfg. Co., Flint, Mich.



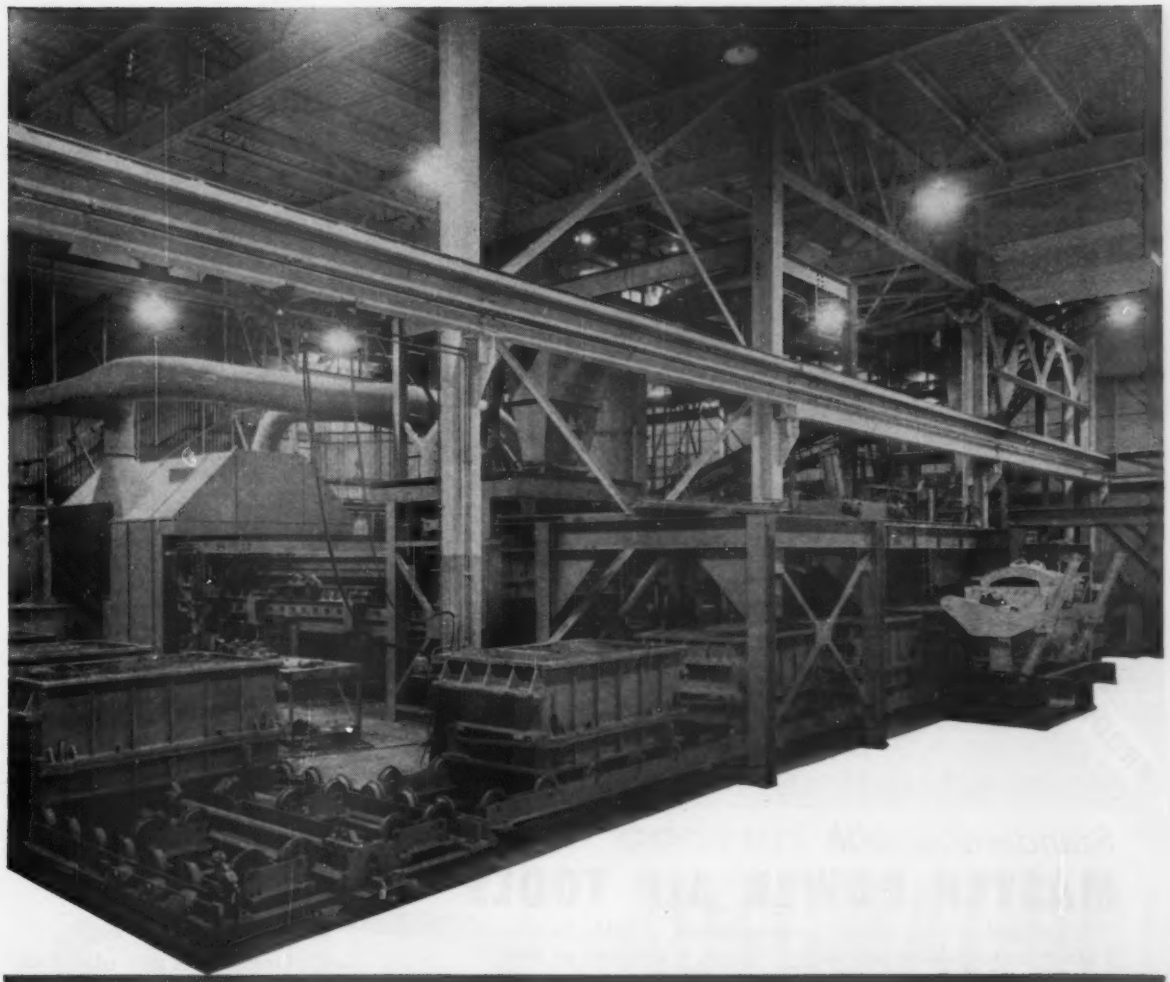
On the Platform: I enjoyed greatly hearing associate editor Jack C. Miske give his maiden talk before an AFS chapter. Jack spoke on "Future Markets for Castings," before the Northeastern Ohio Chapter at Cleveland on Oct. 13. It was an excellent talk, based largely on a study by our research department on future buying plans of a number of industries using castings. A summary of the report will be presented in an early issue.

By the way, I am indebted to both Sterling A. Farmer, Sand Products Corp., and Harold Wheeler, Superior Foundry Inc., for photographs of Jack at the mike.

Show Costs High: Something is being done to cut the high cost of installing and operating exhibits at our complex industrial shows. The AFS has taken the lead in developing a set of service principles, and those serving the hall in San Francisco reportedly have agreed to these policies for the May, 1961 limited exhibit there.

The problem has been outlined by William M. Maloney, general manager of AFS, as follows: "Cost of exhibiting has risen to such a point that we can expect one of three possible actions by exhibitors and organized exhibiting groups. They will either have fewer quality operating and dramatic exhibits, the backbone of any exposition; or they will demand that expositions will be held less frequently; or they will refuse to participate in expositions scheduled for costly and trouble-beset localities. Each of these would seriously jeopardize huge civic investments in new exhibit facilities."

The AFS is to be commended in spearheading this program, for the need is pressing. Already the society is encountering all three types of resistance outlined by Mr. Maloney. Although much of the present resistance can be attributed to



at Universal/Rundle... another example of Planet Versatility

NEW AUTOMATIC MOLD HANDLING SYSTEM

PRODUCES SEVENTY-TWO 14,000-LB. MOLDS PER HOUR

This new automatic bathtub mold handling system is one of the largest and most advanced systems in existence. The system has a capacity to turn out seventy-two 14,000-pound molds (includes flasks, sand and casting) per hour and requires only seven operators.

Engineered and fabricated by Planet Corporation and installed in Universal/Rundle Corporation's Camden, New Jersey, foundry, this new automatic bathtub mold handling system has achieved several "firsts." They are:

- First to be completely shuttle-indexed.
- First to use weights rather than clamps.
- First to incorporate automatic sand metering.
- First to index flasks through shakeout.

Custom designed systems such as this have helped build Planet Corporation's reputation throughout industry as a versatile organization . . . as an organization with solutions to the most perplexing materials handling and automation problems. Let Planet demonstrate how "PV" —Planet Versatility—can help you solve your problems . . . you'll find it pays to plan with Planet.

PLANET CORPORATION

- Engineered Handling Systems
- Automation Equipment
- Mill & Foundry Equipment

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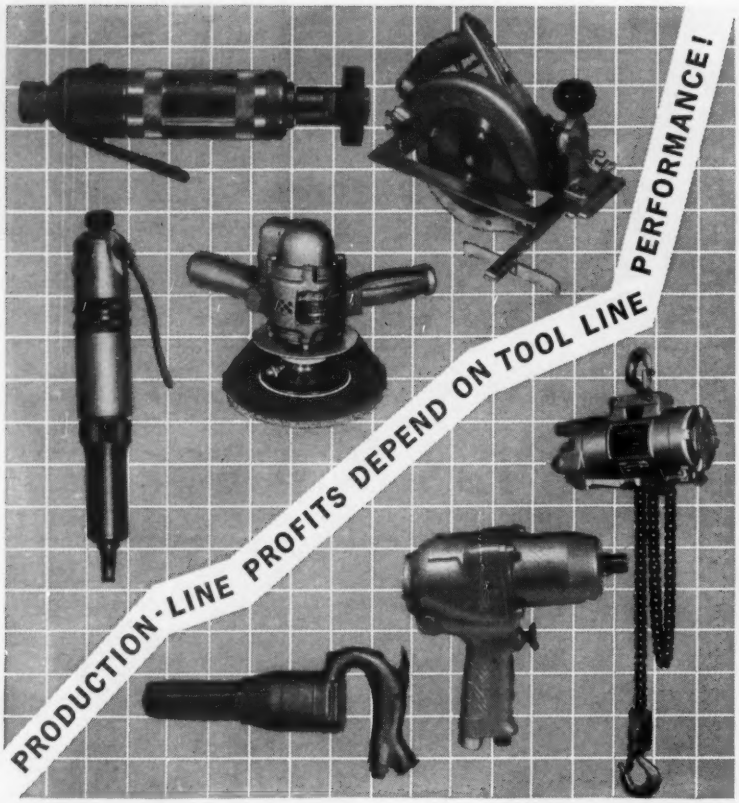
Circle 560 on Page 55



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excessive cost, other factors are contributing to the continuing hassle over frequency of AFS Foundry Shows.

In California: Last month we reported that Kenneth Hapgood (November, Page 215) who joined H. C. Macaulay Foundry Co., Berkeley, Calif., earlier in the year, had been appointed superintendent

of the plant. Now, through the co-operation of Harold E. Henderson (The Sandman) we are privileged to present a photo of Ken (5 ft 1 in.) along with Allan Henderson (6 ft 6 in.) of the sales department. Sort of the long and short of it, don't you think?

Steel Handbook: A new edition of the "Steel Castings Handbook" has just been published by the Steel Founders' Society of America. Coming on the 100th anniversary of the steel casting industry in the United States, this edition far exceeds the previous two in scope, volume of material presented, and number of illustrations. Format and printing are excellent.

Perhaps the most striking change in this 670-page book is the complete rearrangement of the material. Starting with Chapter I on "Advantages of Steel Castings in Machines," the text presents that material of vital interest to design engineers and users. It is not until the next to last chapter that the text gets into "The Manufacture of Steel Castings," and the last deals with history and a look at the future.

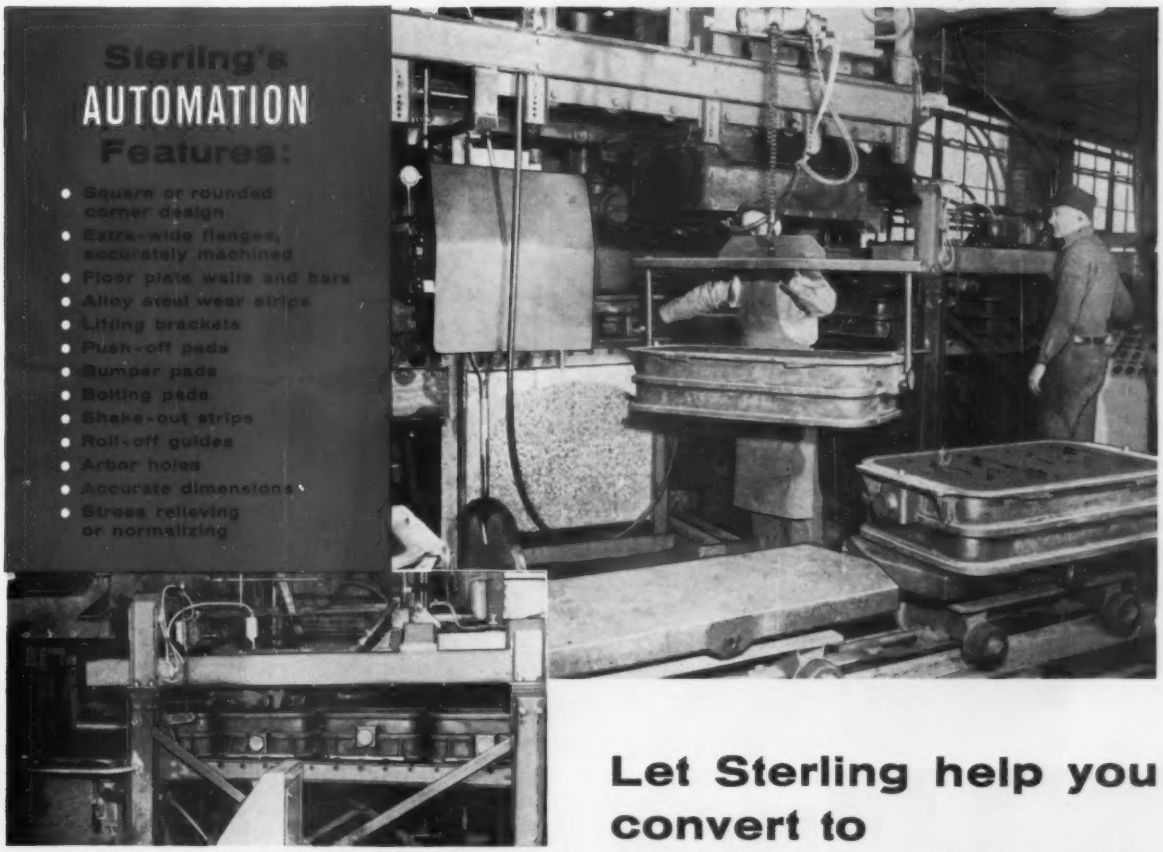
Congratulations to the society and to those who labored hard to make this volume available to the metalworking industry.

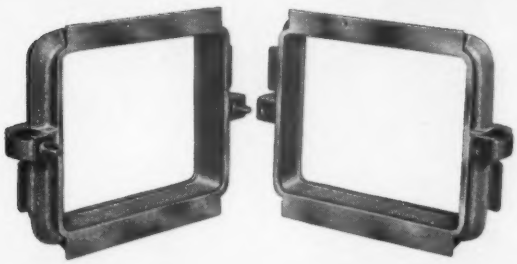
F.G.S.

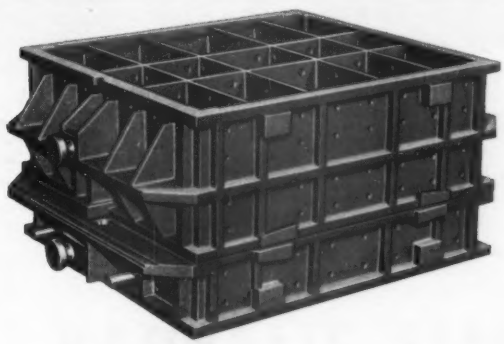
Circle 561 on Page 55

Sterling's AUTOMATION Features:

- Square or rounded corner design
- Extra-wide flanges, accurately machined
- Floor plate walls and bars
- Alloy steel wear strips
- Lifting brackets
- Push-off pads
- Bumper pads
- Bolting pads
- Shake-out strips
- Roll-off guides
- Arbor holes
- Accurate dimensions
- Stress relieving or normalizing







Let Sterling help you convert to AUTOMATION!

Now — you can speed up molding operations by converting your foundry to AUTOMATION. Sterling National Industries, Inc. will gladly assist in making the conversion. For more than a half century Sterling has specialized in the design and fabrication of steel flasks and accessories. And for the past twenty-five years Sterling has turned out rugged, heavy-duty flasks especially designed for successful foundry automation. Why not take advantage of this wealth of experience? If you are considering either full or partial automation, or have any other special flask requirements, contact the nearest Sterling representative — or write directly to the factory for full information.

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Sterling WORLD WIDE SERVICE

Manufacturers of Foundry Equipment for More than Half a Century

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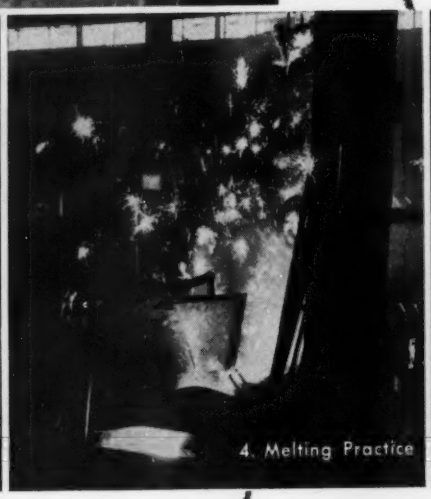
Circle 562 on Page 55

1. Pattern Making

2. Molding Practice

3. Material Selection



4. Melting Practice

5. Pouring Practice

REPUBLIC FOUNDRY SERVICE ENGINEERS GIVE YOU MORE THAN METALLURGICAL HELP

From pattern making to finishing operations, Republic Foundry Service Engineers offer you more than metallurgical assistance.

These men, backed by their complete knowledge of metal behavior and practical foundry experience, are thoroughly qualified to assist you in every department of your foundry operation.

No pressure is applied to promote one grade of pig iron over another, because Republic produces the most complete line of pig iron in the industry. The Foundry Service Engineer recommends the grade best suited to your requirements, your equipment, your specifications. Northern grades include Chateaugay, Foundry, Malleable, Bessemer, and Basic. Southern furnaces produce Malleable, Foundry, and Basic.

To find out more about the latest processes and techniques for improving castings . . . for suggestions on increasing production efficiency . . . for ideas on increasing the use and sale of castings, mail coupon for a call by a Republic Foundry Service Engineer. Republic's Complete Foundry Engineering Service is available to all foundries without obligation.

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A complete line of chemical and metallurgical compounds ...For Aluminum and Zinc

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CALENDAR of Meetings

Nov. 30 - Dec. 2 — Metallurgical Society of AIME, Electric Steel Conference, Morrison Hotel, Chicago.

Dec. 2—Malleable Founders' Society, semi-annual meeting, Sheraton-Cleveland Hotel, Cleveland.

Dec. 6—Electric Overhead Crane Institute, annual meeting, Carlton House, Pittsburgh.

Dec. 12-14—Material Handling Institute, annual meeting, Savoy-Hilton Hotel, New York.

1961

Jan. 9-13—Society of Automotive Engineers, International Congress & Exposition, Convention Center, Detroit.

Jan. 10—Hoist Manufacturers Association, annual meeting, Statler Hilton Hotel, Cleveland.

Jan. 23-26—Plant Maintenance & Engineering Show, International Amphitheatre, Chicago.

Feb. 9-10—Wisconsin Regional Foundry Conference, Schroeder Hotel, Milwaukee.

Feb. 16-17—Southeastern Regional Foundry Conference, Read House, Chattanooga, Tenn.

Feb. 22-24—Alloy Casting Institute, Midwinter Management Meeting, Boca Raton, Fla.

Feb. 26-Mar. 2—American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, St. Louis.

March 1-2—Malleable Founders' Society, Technical & Operating Conference, Pick-Carter Hotel, Cleveland.

March 11-14—Steel Founders' Society of America, annual meeting, Drake Hotel, Chicago.

March 20-24—American Society for Metals, Western Metal Congress & Exposition, Pan-Pacific Auditorium, Los Angeles.

April 10-12—American Institute of Mining, Metallurgical & Petroleum Engineers, Open Hearth Steel Conference, Sheraton Hotel, Philadelphia.

April 18-20—American Welding Society, Annual Meeting & Welding Show, Commodore Hotel and Coliseum, New York.

April 18-20—Foundry Educational Foundation, annual college-industry conference, Hotel Statler, Cleveland.

May 8-12—American Foundrymen's Society, Castings Congress & Exposition, San Francisco.

June 8-9—Malleable Founders' Society, annual meeting, Broadmoor, Colorado Springs, Colo.

June 13-14—Connecticut Safety Society, annual meeting, Statler-Hilton Hotel, Hartford, Conn.

June 18-20—Alloy Casting Institute, annual meeting, Homestead, Hot Springs, Va.

June 22-24—Penn State Regional Foundry Conference, Pennsylvania State University, University Park, Pa.

June 25-30—American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

Sept. 18-20—Non-Ferrous Founders' Society, annual meeting, Shawnee Inn, Shawnee-on-Delaware, Pa.

Sept. 21—Cast Bronze Bearing Institute, annual meeting, Shawnee Inn, Shawnee-on-Delaware, Pa.

Sept. 24-26—Steel Founders' Society of America, fall meeting, Homestead, Hot Springs, Va.

Oct. 18-20—Gray Iron Founders' Society, annual meeting, Royal York Hotel, Toronto, Ont.

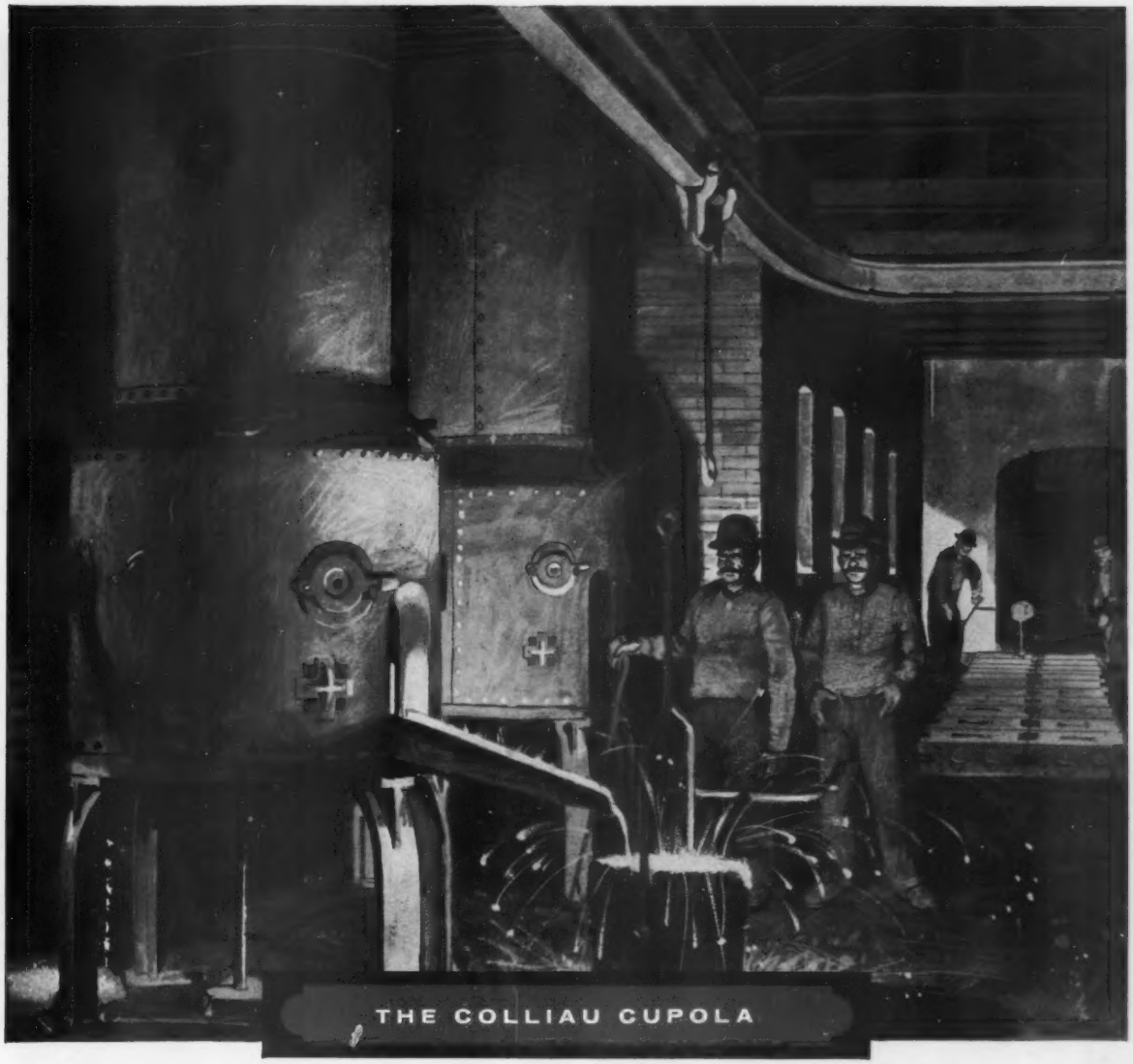
Oct. 19-21—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, Va.

Oct. 23-27—American Society for Metals, National Metal Congress & Exposition, Cobo Hall, Detroit.

Nov. 13-15—Steel Founders' Society of America, Technical & Operating Conference, Hotel Carter, Cleveland.

Nov. 15-17—National Foundry Association, annual meeting, Savoy-Hilton Hotel, New York.

Gray Iron Foundry Milestones—No. 5



THE COLLIAU CUPOLA

ONE of the most significant developments in the history of the Gray Iron Foundry Industry was the invention of the cupola in the early 18th century.

The first cupola was introduced in the United States about 1815, but it wasn't until 1874 that the first prefabricated commercial cupola, the *Colliau*, was manufactured in this country. The Colliau offered several new features including a hot blast, a double row of tuyeres, and other improvements which produced a fast, economical iron melt.

The introduction of the cupola into the foundry marked the point at which foundry operations and steel making went their separate ways . . . and each eventually became a vital factor in the American economy.

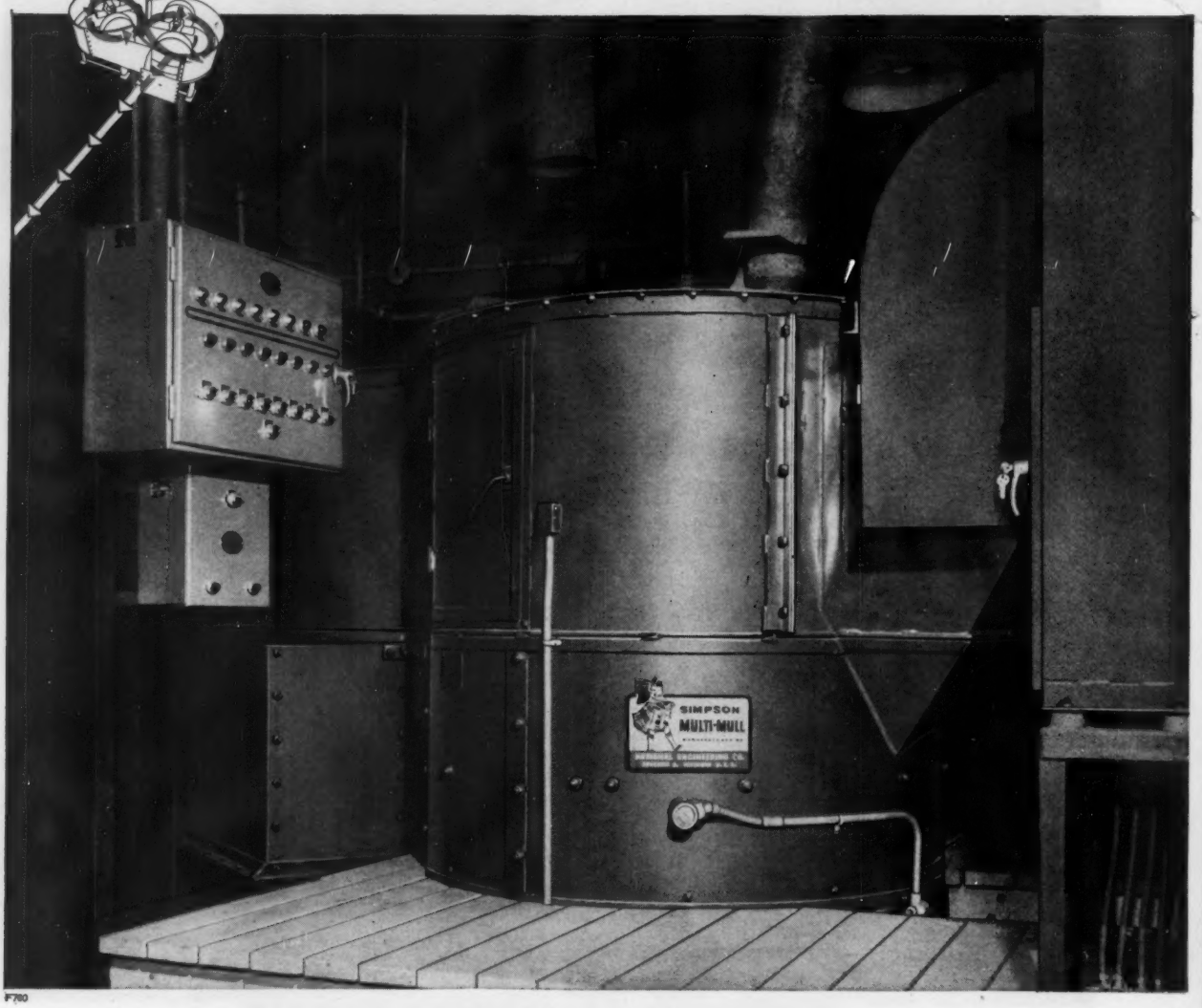
As a supplier of quality foundry coke and pig iron, Pittsburgh Coke & Chemical Company is proud to contribute to the continuing growth of the great Gray Iron Foundry Industry.

Reproductions of the "The Colliau Cupola," suitable for framing, may be obtained without charge by writing to the Coke & Iron Division, Pittsburgh Coke & Chemical Company, Grant Building, Pittsburgh 19, Pa.

COKE & IRON DIVISION
PITTSBURGH
COKE & CHEMICAL CO.
GRANT BUILDING PITTSBURGH 19, PA.

Neville Pig Iron and Neville Coke for the Foundry Trade 1840

HOW WOLVERINE BRASS IMPROVED CASTING



F700

SIMPSON MULTI-MULL GOES TO WORK

Wolverine Brass Works, Grand Rapids, Michigan, wanted to improve their casting finish. A switch-over to synthetic sand and better control over sand properties was indicated . . . so was a new mixer. Their pug mill, though it could meet *quantity* requirements, could not turn out the *quality* of sand needed to meet these Wolverine requirements:

- A continuous, but variable, flow of sand to the molders.
- Moisture control within $\pm 0.1\%$ limits.
- Improved flowability, green strength and permeability of molding sand.

National helped them to accomplish this and *more* with a Model 21½F Simpson Multi-Mull . . . a unit especially designed to meet the foundryman's increasing need for *mulled* system sands in continuous quantities. After one year's operation, here's what Wolverine reports:

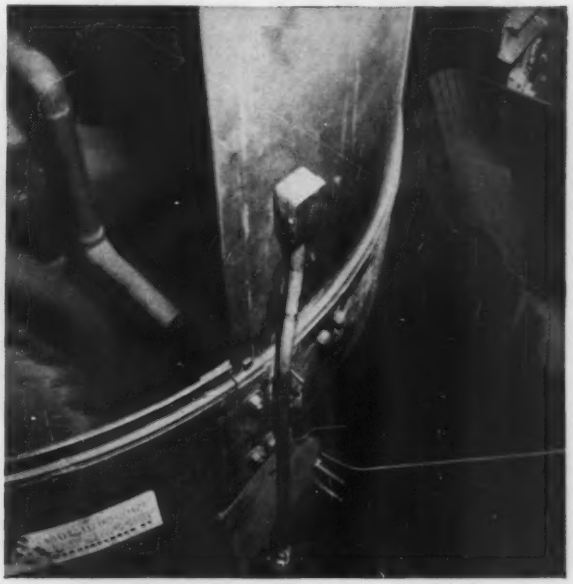
- Sand flow can be paced to molding requirements. System can deliver anywhere from 1 to 40 tons of sand per hour.
- Green strength increased.
- Continuous mulling system requires little operator attention.
- Electronic moisture control device eliminates human element.
- Sand properties greatly improved; reduced clay balls, better flowability, less mold tear.
- Superior casting finish.

If you're looking for high continuous production of *mulled* system sand, investigate *Multi-Mull*. A new National bulletin shows you how it can deliver up to 50% more hourly production than two batch mixers of equivalent pan diameter.

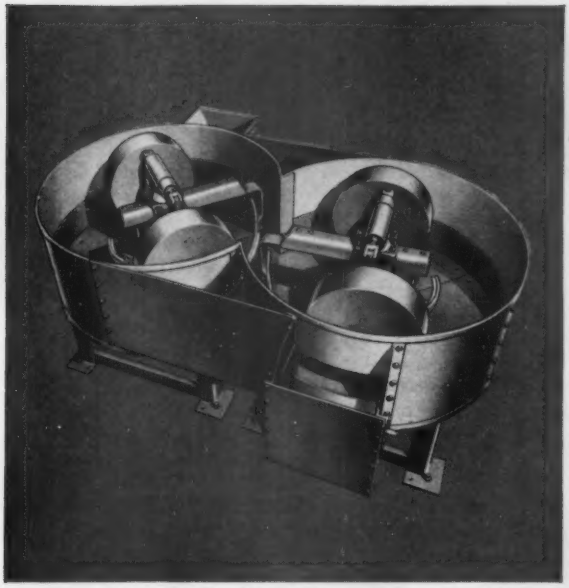
Write for a copy.

QUALITY WITH CONTINUOUS MULLING

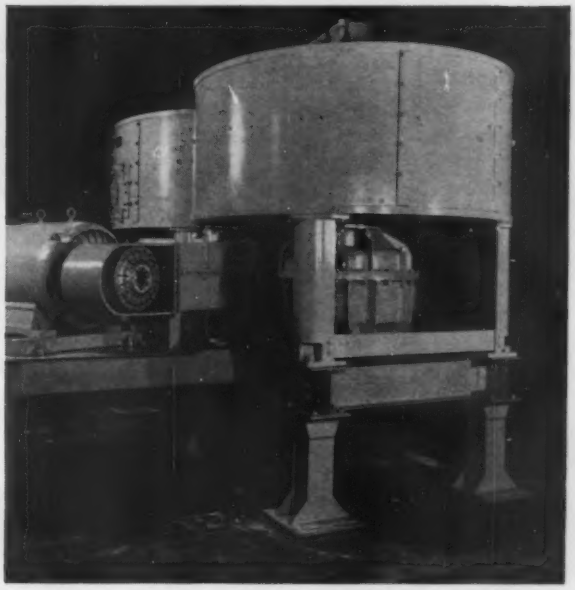
At Wolverine Brass, automatic monitoring system controlled by probe into hopper (arrow) assures ready supply of sand to the molders at all times.



Properly mulled sand controlled for moisture to within ± 0.1% is discharged to boot of bucket elevator at rates which can be controlled from 1 to 40 tons per hour.



The Simpson Multi-Mull is available in 6 models in retention capacities of 600 to over 9000 lbs. Hourly production capacities can be as much as 50% greater than two batch mixers of equivalent size.



Model 23F Multi-Mull . . . built to same exacting standards and utilizing the same proven mulling principle established by batch-type Simpson Mix-Mullers in almost 50 years of foundry service.

NATIONAL ENGINEERING COMPANY

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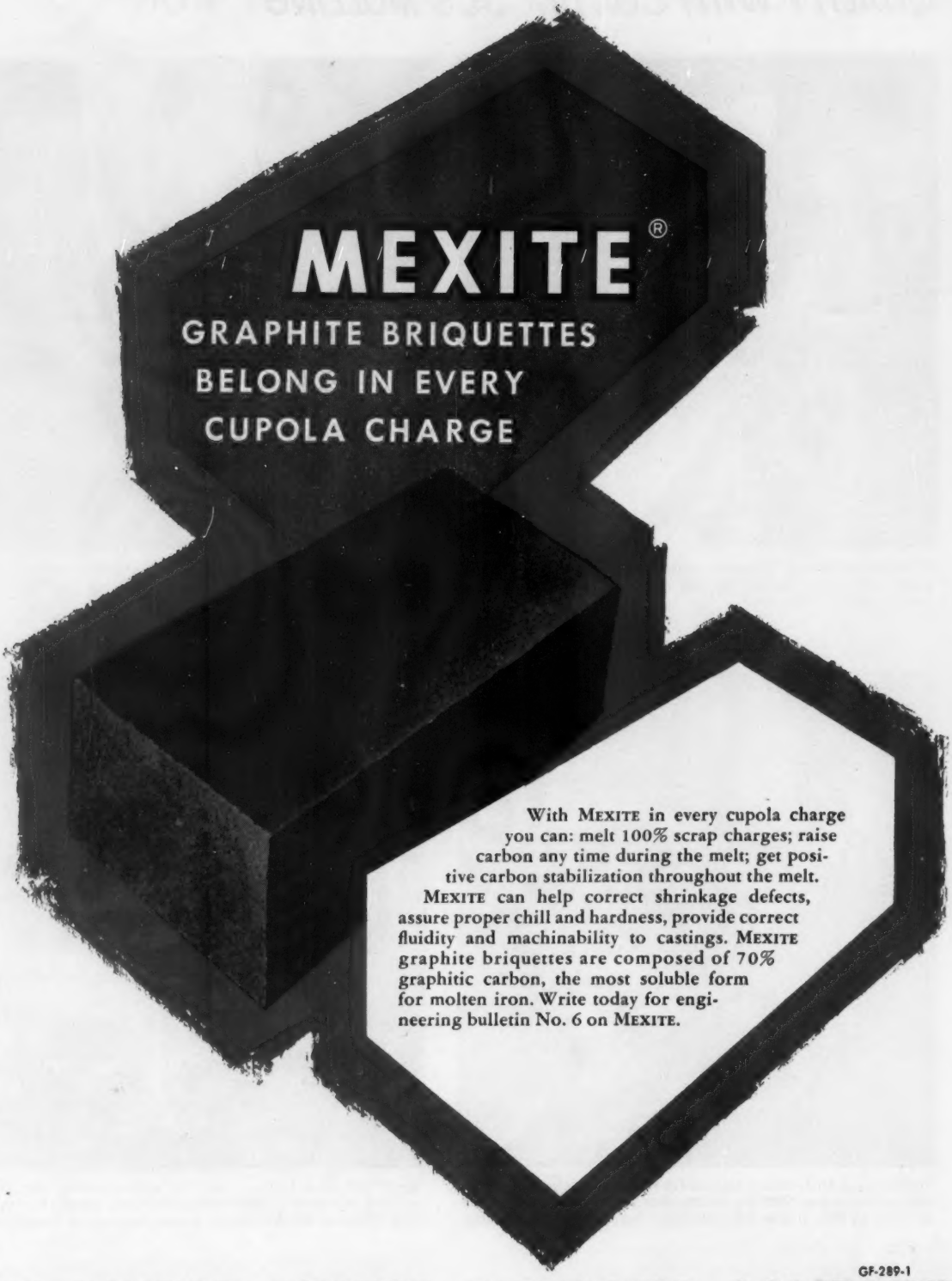

With MEXITE in every cupola charge you can: melt 100% scrap charges; raise carbon any time during the melt; get positive carbon stabilization throughout the melt.

MEXITE can help correct shrinkage defects, assure proper chill and hardness, provide correct fluidity and machinability to castings. MEXITE graphite briquettes are composed of 70% graphitic carbon, the most soluble form for molten iron. Write today for engineering bulletin No. 6 on MEXITE.

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DIVISION OF THE WICKES CORPORATION, SAGINAW 14, MICHIGAN

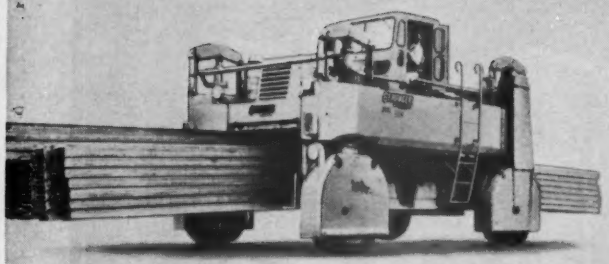
GRAPHITAR® CARBON-GRAPHITE • GRAMIX® POWDER METALLURGY • MEXICAN® GRAPHITE PRODUCTS • USG® BRUSHES

Circle 567 on Page 55

Circle 568 on Page 55→

TOWMOTOR-GERLINGER

offers you three complete capital-saving services!



1 YOU LEASE *without down payment!*

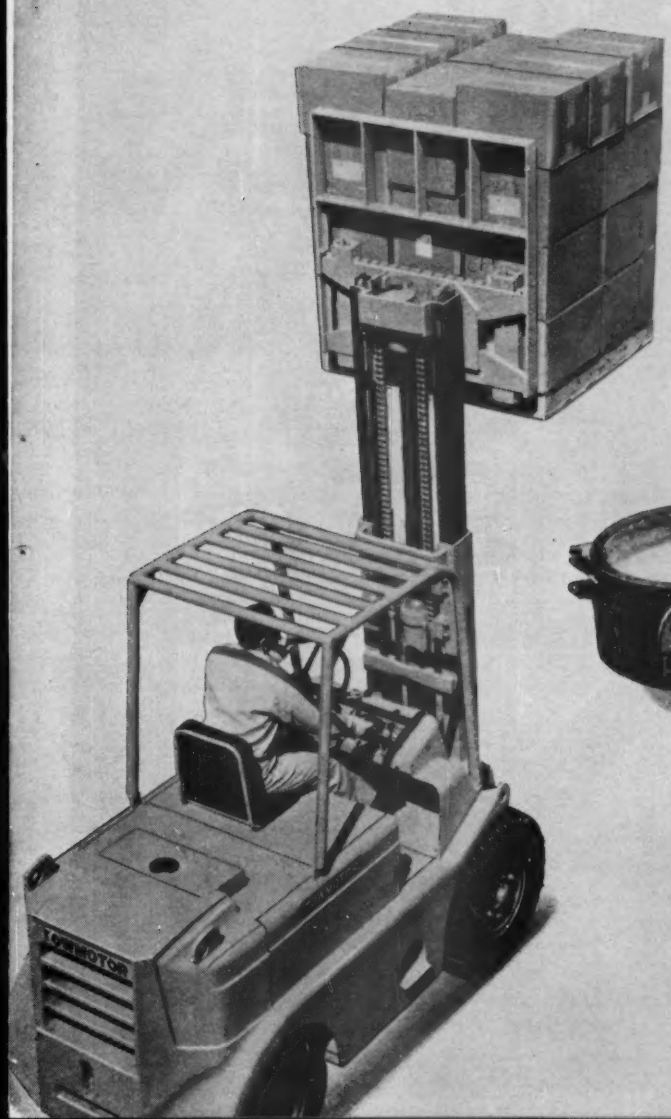
You don't make a *down payment* when you use the Towmotor-Gerlinger Lease-A-Truck Plan. You put T-G equipment to work on a continuous, year-'round basis. You just make a small monthly payment—paid out of savings the equipment produces.

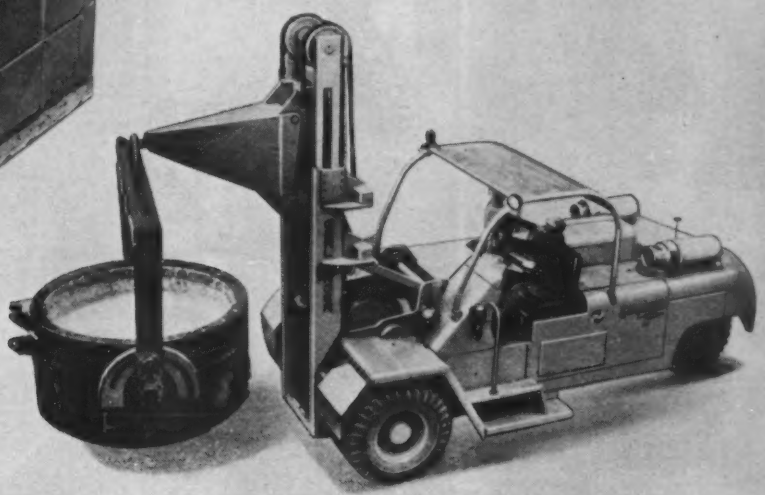
2 YOU RENT *without cash outlay!*

You don't tie up working capital when you *rent* Towmotor-Gerlinger fork lift trucks and material carriers. You put them to work immediately. You start cutting handling costs immediately. Your only cash outlay is one small monthly charge.

3 YOU BUY *and save as you pay!*

You don't pay cash for Towmotor-Gerlinger equipment when you use our low-cost Time Payment Plan. You make reasonable monthly payments. Low interest rates make it easy. Handling economies consistently pay the monthly cost many times over.





Complete factory-supervised maintenance can be included in *any* of the above plans! For complete information, write Towmotor-Gerlinger Rental Division, Towmotor Corporation, Cleveland 10, Ohio.

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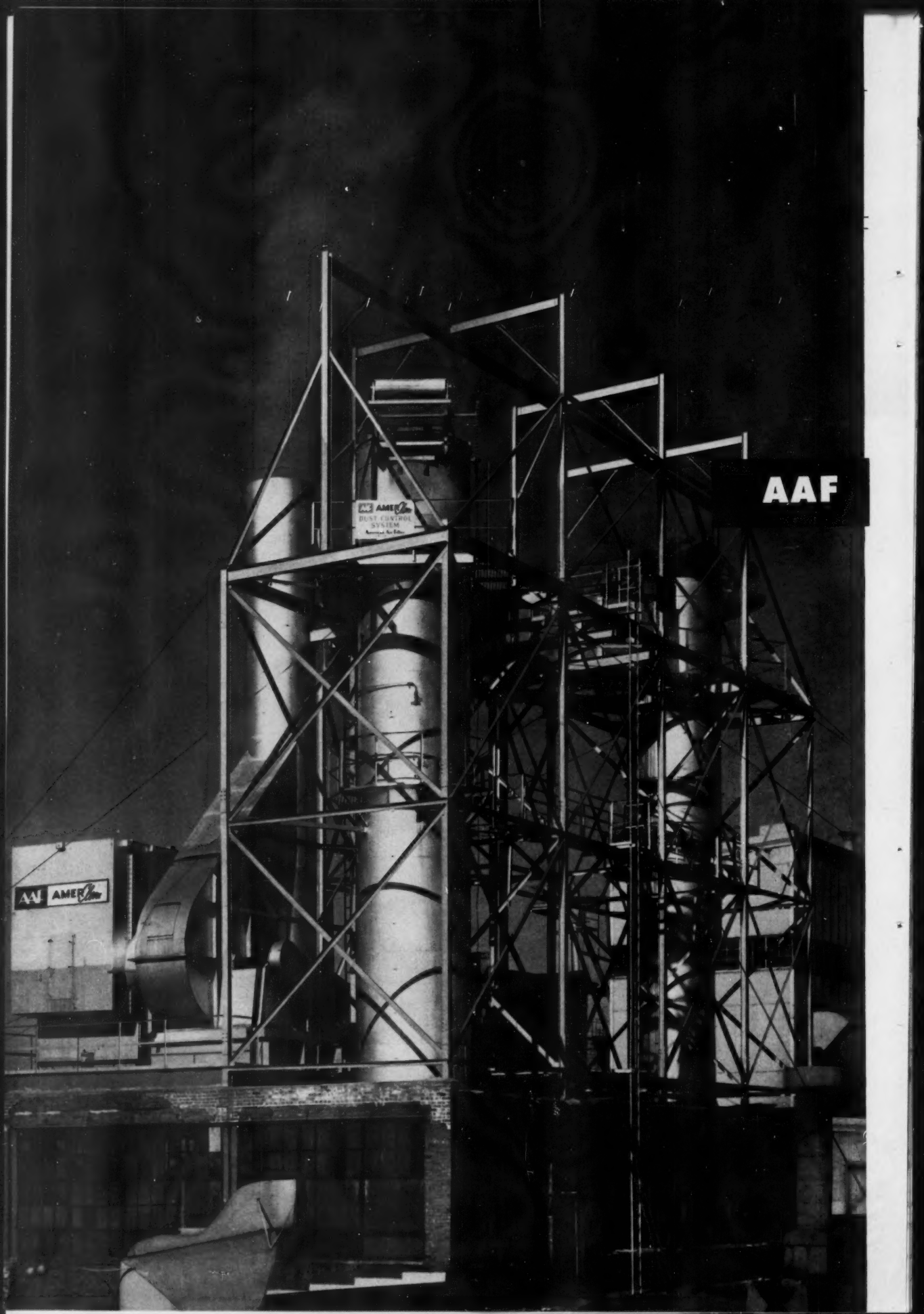
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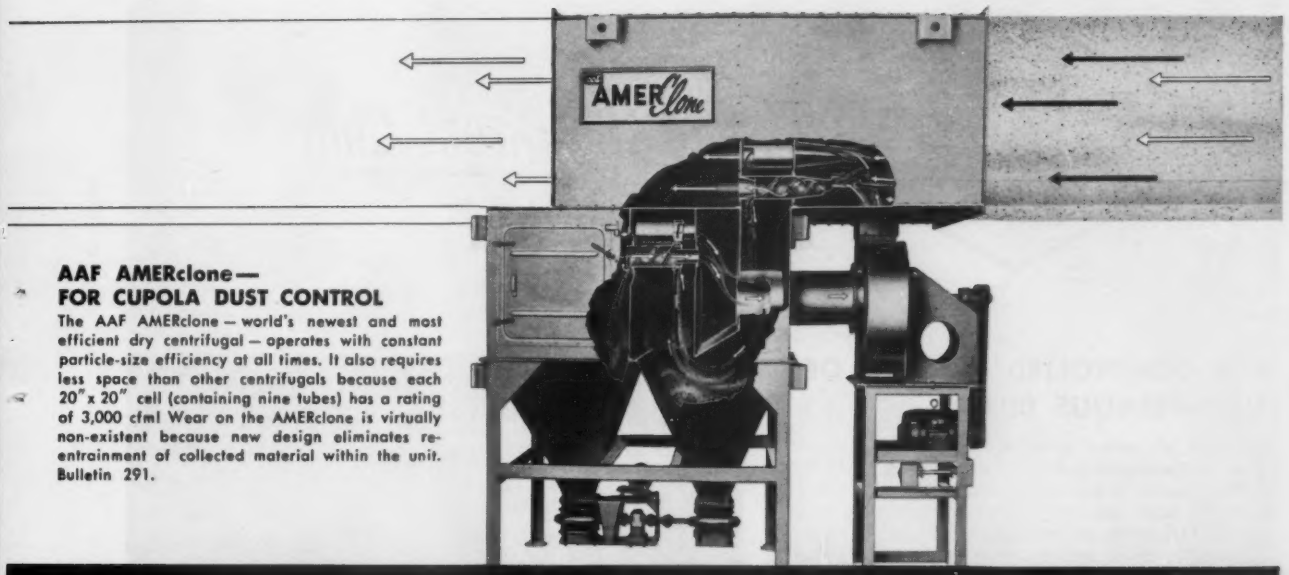
AAF AMERAire
DUST CONTROL
SYSTEM



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FOR CUPOLA DUST CONTROL

The AAF AMERclone — world's newest and most efficient dry centrifugal — operates with constant particle-size efficiency at all times. It also requires less space than other centrifugals because each 20" x 20" cell (containing nine tubes) has a rating of 3,000 cfm! Wear on the AMERclone is virtually non-existent because new design eliminates re-entrainment of collected material within the unit. Bulletin 291.

CONTROLS DUST AT GOLDEN FOUNDRY

- **AAF AMERclone collects 15 lbs. of dust per ton of melt in CUPOLA!**
- **TYPE N ROTO-CLONES keep SAND CONDITIONING SYSTEM dust-free!**
- **TYPE D ROTO-CLONES take the grime out of GRINDING!**

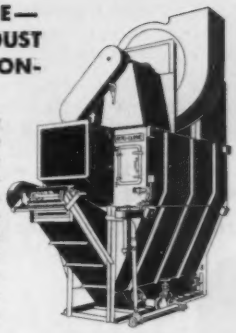
Golden Foundry, a gray iron foundry in Columbus, Indiana, is a good example of an alert, neighborhood-conscious foundry using the most modern methods for combatting dangerous dust.

Golden's cupola system (including a No. 8 and a No. 10 cupola) is melting 17 tons of iron per hour. For every ton melted, the AAF AMERclone is removing 15 lbs. of dust! Here are the dividends:

- **Eliminates neighborhood complaints.**
- **Eliminates damage to cars in parking lot.**
- **Saves insurance rates.**
- **Increases visibility for workers on charging floor.**
- **Cuts foundry maintenance costs, especially roof maintenance.**

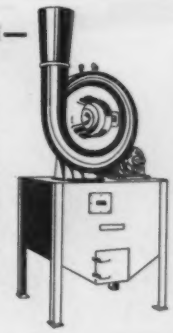
AMERclone serves two cupolas alternately, permitting full-time use of equipment. It is collecting fly ash, iron oxide, silica and other contaminants which otherwise would become an air pollution and maintenance problem. AMERclone traps the particles that cinder catches miss . . . the *small* particles that create *big* problems. American Air Filter Company, Inc., 266 Central Avenue, Louisville 8, Ky. In Canada: American Air Filter of Canada. Ltd., Montreal, P. Q.

TYPE N ROTO-CLONE—
FOR CONTROL OF DUST ON SAND CONDITIONING SYSTEMS



The high cleaning efficiency of AAF's wet-collecting Type N ROTO-CLONE results from the combined action of centrifugal force and the thorough intermixing of water and dust-laden air. There's no secondary dust problem with the Type N, and its compact design makes for important space savings. Bulletin 277.

TYPE D ROTO-CLONE—
FOR CONTROL OF GRINDING DUST



AAF's dry-collecting Type D draws in the dust-laden air, delivers the collected material to the storage hopper, and expels the clean air—all in a single operation with only one moving part: the impeller. Exhauster and separator are combined in a compact, self-contained unit. Bulletin 272.

American Air Filter
BETTER AIR IS OUR BUSINESS

Circle 569 on Page 55

PMD . . . and the Direct Chill casting method

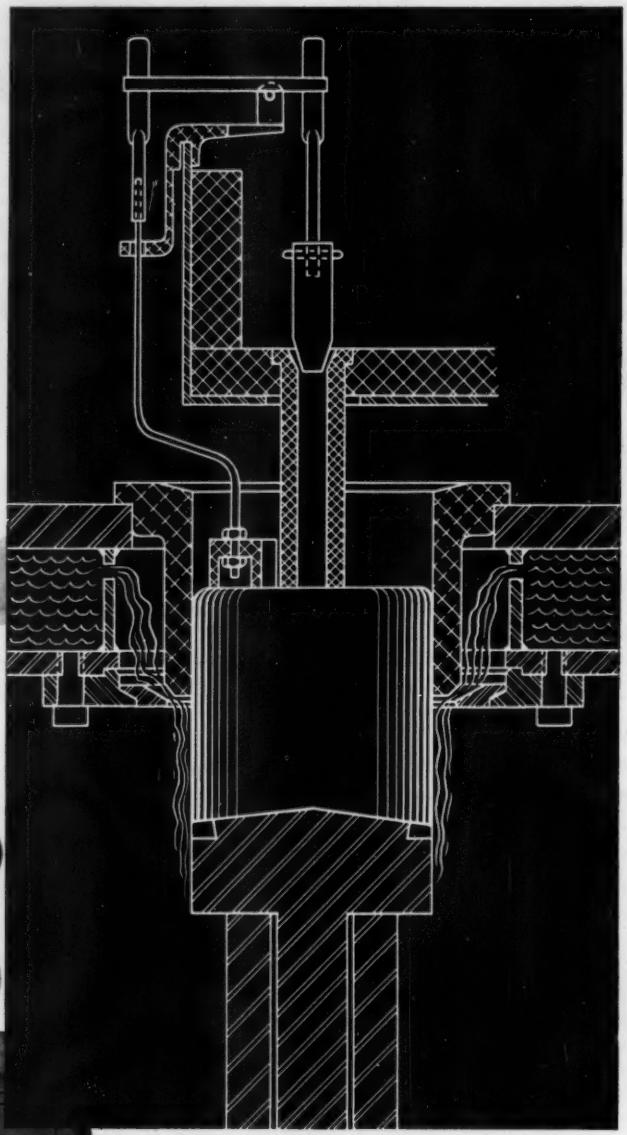
FOR CONTROLLED CASTING OF NON-FERROUS BILLETS

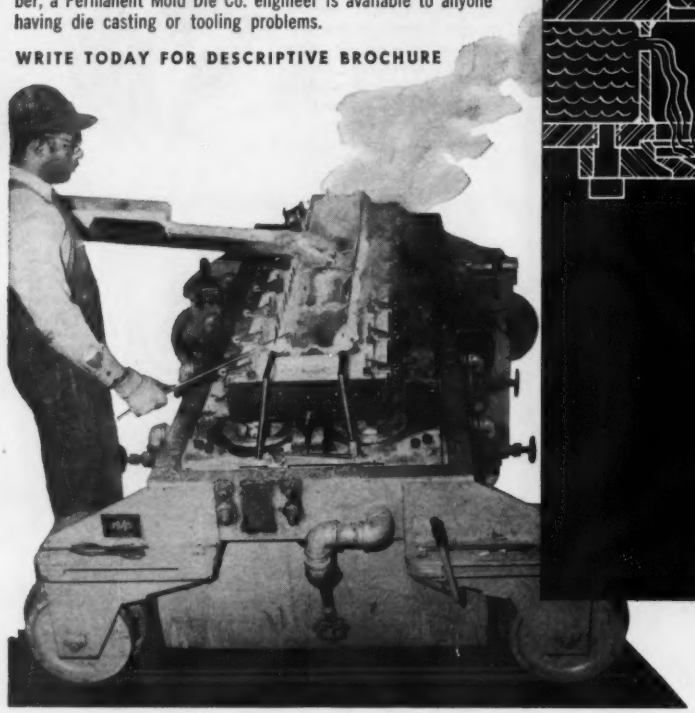
The direct chill method of casting has practically eliminated all of the objectionable defects that are present in most static castings. Because of the controls available to vary the casting conditions, billets cast by this method are particularly sound and free from segregation, porosity, and inclusions. Grain size and structure can be controlled or varied for different applications.

Direct chill casting is accomplished by pouring molten metal into an open end, water cooled mold that is closed at the bottom by a movable block. As the metal solidifies sufficiently to form a skin, the bottom block is lowered at a controlled rate and the direct chill casting is in process. A wide variety of shapes and forms is possible to cast in bar lengths replacing individual castings, resulting in considerable savings in machining and fewer rejects because of casting flaws.

Permanent Mold Die Company is a pioneer in the direct chill casting process. Through the research facilities of PMD, better casting methods are constantly being devised . . . methods that insure higher quality castings at lower costs. And remember, a Permanent Mold Die Co. engineer is available to anyone having die casting or tooling problems.

WRITE TODAY FOR DESCRIPTIVE BROCHURE





PMD

PERMANENT MOLD DIE COMPANY

2275 E. Nine Mile Rd. • Warren, Michigan • Phone: SLocum 7-8100

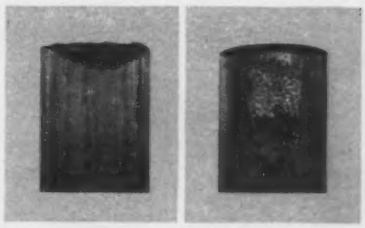
Circle 570 on Page 55

Riser metal stays molten twice as long with J-M RIS-A-SLEEV

THE INSULATED RISER SLEEVE FOR NON-FERROUS METALS THAT ASSURES UNIFORM FEEDBACK TO EVERY PART OF THE MOLD

Now you can get perfect finished castings every time with Johns-Manville Ris-A-Sleev®, the new riser sleeve that cuts heat transfer in half. The heat is contained *in the sleeve,* keeping the metal molten twice as long as the most effective competitive product. This allows more time to complete feed-back.

Ris-A-Sleev's more effective insulation serves to reduce the size of the risers, thereby giving you closer control of solidification. What's more, smaller risers mean a big reduction in cut-off waste. The following photographs graphically demonstrate Ris-A-Sleev's superiority over a leading competitive product.



Under identical test conditions, brass pourings were made with a Ris-A-Sleev and an ordinary riser sleeve. Note how riser metal from the mold equipped with a Ris-A-Sleev (left) has solidified uniformly with very little concavity, indicating uniform feedback to mold. Then note how the riser from mold using competitive sleeve (right) has cooled quickly around circumference, while center of riser stayed molten, resulting in pronounced concavity and uneven feedback.

Try Johns-Manville Ris-A-Sleev and discover the economic way to improve bronze, brass and aluminum castings. They are available in a complete range of sizes. For full information write Johns-Manville, Box 14, New York 16, N. Y. Ask for brochure IN-247A.

JOHNS-MANVILLE

AN INSULATION FOR EVERY COMMERCIAL AND INDUSTRIAL USE

JOHNS-MANVILLE JM PRODUCTS

Circle 571 on Page 55

At Kennecott's new refinery... Twin Heroult Electric Furnaces designed

Copper cathodes are charged into the 13,500 KVA Heroult 90-ton electric arc furnace, one of two at Kennecott Refining's new plant south of Baltimore. American Bridge also fabricated and erected the plant's structural framework.

to keep 16,500-ton per month copper melt on schedule

Kennecott Refining Corporation's electrolytic copper refinery near Baltimore is the country's newest—a showplace of efficiency. One reason: a pair of 90-ton Heroult electric arc furnaces, each rated at 40 tons per hour.

Of nose-tilt design to facilitate launder pouring, they discharge a steady stream of molten copper (2150°) which is used in the horizontal casting of wire bars and the continuous casting of billets. One Heroult is on normal capacity operation while the other is a spare for use during relining, when the pre-heat furnace is down, or when additional production is required.

Copper cathodes are preheated to about 1400°F and door charged into the Heroult arc furnace on a peel arm crane. The three-phase power input utilizing ultra-high speed mechanical positioning for three 20" electrodes with high-speed sensitive regulators maintains a constant arc above the copper bath for uniform temperature casting.

The two 90-ton Heroult arc furnaces can be tilted 40° forward and 15° backward. They feature mechanically positioned masts and special water-cooled skew-back roof rings that introduce water flow at the critical roof juncture to prevent warpage and burn out.

Whatever your arc-melt problem there is a Heroult electric arc furnace design for you. We've made them from 3 tons to over 200 tons capacity, for both swing roof top charge or door charge operation. They can accommodate induction stirring equipment, and can be designed for duplexing arrangements. And every Heroult is designed for maintenance by your own crew.

American Bridge has a complete electric furnace service that includes new installation, furnace modernization and part replacement. We'll be happy to quote on your building needs, too. Call our nearest office.

USS and Heroult are registered trademarks

American Bridge Division of United States Steel

USS

General Offices: 525 William Penn Place, Pittsburgh, Pa. Contracting Offices in New York Philadelphia, Chicago, San Francisco, and other principal cities.
United States Steel Export Company, New York

This mark tells you a product is made of modern, dependable Steel.

Circle 572 on Page 55

News about

B.F.Goodrich Chemical *raw materials*

Photo shows core-making operation at I-F Manufacturing Company, New Philadelphia, Ohio.

I-F MANUFACTURING COMPANY TELLS HOW:

new Good-rite CB-40 cuts drying time sharply

The new low-gassing mold and core binder, Good-rite CB-40, really performs on malleable iron as well as on light metal precision castings. Here's what I-F Manufacturing Company, New Philadelphia, Ohio, says:

Faster production: A drastic reduction in dielectric oven time cuts costs. Conventional binders formerly required at least 1½ hours of baking —now Good-rite CB-40 cuts baking time to 10 minutes on this job. Good-rite CB-40 can be used with any present method—oven temperature isn't critical, it is safe at all stages, is non-inflammable, releases no objectionable fumes.

Excellent collapsibility and shakeout: Rate of collapse is chemically controlled to prevent burn-in. Collapsed sand flows freely from castings.

Low-gassing: The exceptionally small amounts of gas mean that blow holes are completely eliminated. Scrap is reduced. Finer sands can be used, producing unusually smooth finishes and eliminating machining. Good-rite CB-40 provides excellent dimensional stability in the core, which results in far closer tolerances in the casting.

More information: You can learn about improved production and lowered production costs with Good-rite CB-40 by writing Dept. JE-6, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Good-rite CHEMICALS

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

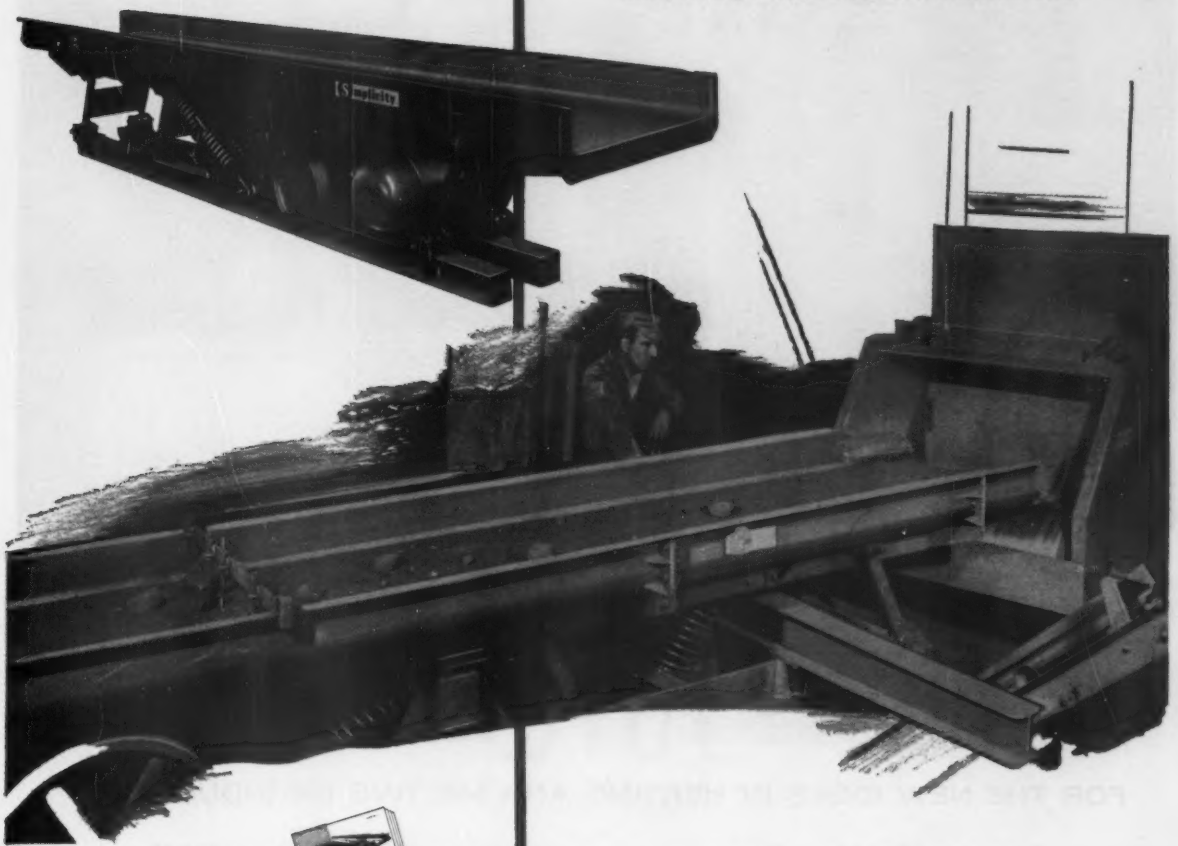
Circle 573 on Page 55

An Eastern Foundry Conveys and Cools 120 Tons per Hour of Sand with Simplicity "VS" Conveyor

The Simplicity model "VS" conveyor shown moves hot sand from two shakeouts, up a three degree incline, to an elevator at an average rate of 80 tons, with a peak load of one hundred twenty tons per hour. As the sand moves along the conveyor deck, water is added and plows turn the sand thus reducing the sand temperature one hundred degrees. The sand is discharged from the conveyor into the elevator boot over a permanent magnet which removes all of the metal particles.

Simplicity conveyors have proved efficient for transferring materials such as sand and castings, from one point to another. Feed points can be positioned along the length of the conveyor, and materials transferred to a common discharge point.

"VS" conveyors are available in widths from 12" to 36" and in lengths from 10' to 60' with one drive assembly. At customer request, these conveyors can be equipped with liners, covers, or can be built in two surface units.



Write for catalog C-1 which describes the various models of Simplicity Conveyors.

Simplicity
TRADE MARK REGISTERED

ENGINEERING COMPANY • DURAND 7, MICHIGAN

SALES REPRESENTATIVES IN ALL PARTS OF THE U.S.A.
FOR CANADA: Simplicity Materials Handling Limited, Guelph, Ontario.
FOR EXPORT: Brown & Sites, 50 Church Street, New York 7, N. Y.

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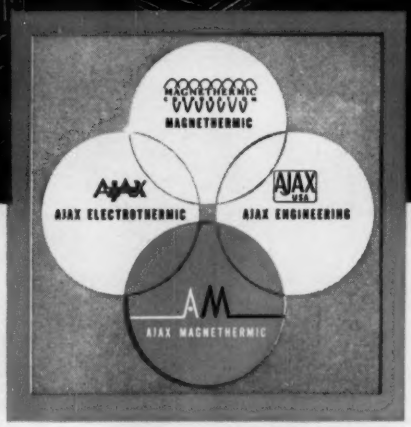
Circle 574 on Page 55

These twin 1000-lb. melting furnaces prepare copper for metal powder at the St. John's, Michigan, plant of Federal-Mogul-Bower Bearings, Inc.



WATCH AM

FOR THE NEW IDEAS IN HEATING AND MELTING BY INDUCTION

Copper Melting Furnaces, one of many products of AM, for the heating or melting of metals by Induction.

"induction heating is our only business"

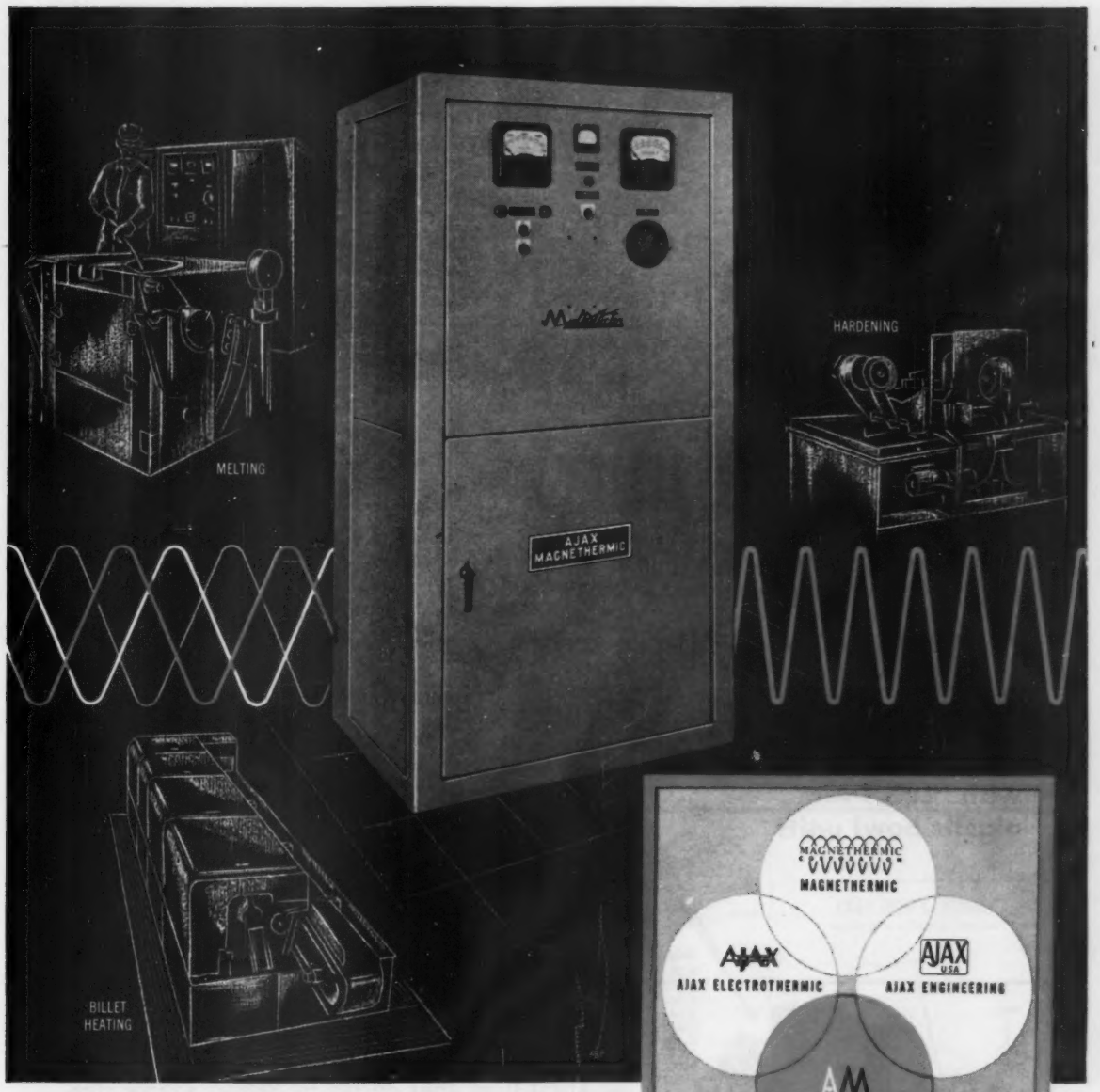
AJAX Magnethermic CORPORATION

GENERAL OFFICES
P. O. BOX 839
Youngstown 1, Ohio

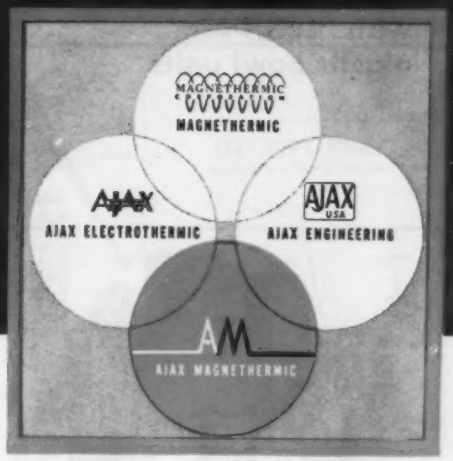
TRENTON DIVISION
930 Lower Ferry Road
Trenton 5, New Jersey

YOUNGSTOWN DIVISION
3990 Simon Road
Youngstown 1, Ohio

Circle 575 on Page 55



The 180-cycle Multiductor, a low-cost static frequency converter, permits the use of induction on heating and melting applications where costs were previously prohibitive.



THE NAME WITH THE FAMILIAR RING!

The Multiductor, one of several Power Sources... another major product line of AM for the heating or melting of metals by Induction.

"induction heating is our only business"

AJAX Magnethermic CORPORATION

GENERAL OFFICES
P. O. BOX 839
Youngstown 1, Ohio

TRENTON DIVISION
930 Lower Ferry Road
Trenton 5, New Jersey

YOUNGSTOWN DIVISION
3990 Simon Road
Youngstown 1, Ohio

Circle 576 on Page 55

NEW... AND AVAILABLE

•

"LUBRI-AIR®"

FILTER, AND LUBRICATOR

METAL BOWL UNITS

•

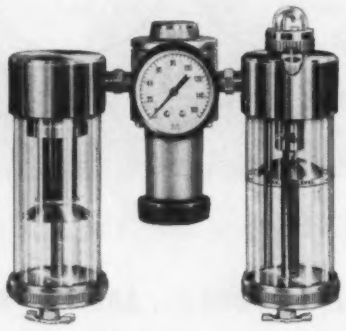
VISIBLE OIL LEVEL

VISIBLE OIL FLOW

•

INTERCHANGEABLE

with "Lubri-Air" plastic bowl units



New metal bowl "Lubri-Air"® Filters and Lubricators are obtainable in ¼" and ⅜" port sizes, with immediate delivery. Other sizes will follow. Conversion units for ¼" and ⅜" plastic bowl "Lubri-Air" units are also available. Write for Sales Manual LA-20M . . . Dept. **FO - 1260,** Bellows-Valvair, Akron 9, Ohio . . . or, call your Bellows-Valvair Field Engineer.

Without losing the feature of "VISIBILITY OF CONTENTS" which gives plastic Filter and Lubricator bowls a universal appeal, the new Sight Glass-Metal Bowl units offered by Bellows-Valvair eliminate the hazards caused when plastic containers break down from chemical action. "Lubri-Air" aluminum Filter and Lubricator units may be used for higher pressure, higher temperature applications than plastic bowls; they are not affected when fire-resistant oils are used in compressor or lubricating systems. The sight glass has wide angle visibility for easy level reading . . . Lubricators (unit shown above) have a tempered Pyrex glass dome for quick determination of oil flow.

917C

Bellows-Valvair

Bellows-Valvair

AKRON 9, OHIO

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

Late News

ALUMINUM BLOCKS: Production of diecast aluminum blocks for the 1961 Rambler Classic Six has passed the 50,000 mark. The producer, Doehler-Jarvis Div., National Lead Co., Toledo, Ohio, is making them on four 2000-ton locking capacity machines. Each machine turns out 20 to 22 blocks an hour.

A fifth machine, to go into operation soon, uses a more sophisticated die. It incorporates vacuum and can service itself between shots, thus reducing substantially the two minutes needed for a manual operation. This die is expected to produce at least 30 blocks an hour, possibly as many as 50 eventually.

COMPETITION: Although the permanent mold and diecasting processes have captured the headlines in aluminum motor block production, the auto companies likely will take a long look at sand casting before abandoning it. Thomas B. Pfaff, Pontiac's assistant foundry superintendent, gave the recent National Die Casting Congress some reasons why the sand foundry can offer strong competition to other processes.

Speaking of the Pontiac foundry, he said, "With one set of patterns, costing no more than one set of dies, we are ready to produce 200 cylinder blocks an hour every hour. As a diecaster, what would be your tooling cost for this rate of block production? We venture to guess that the cost would be prohibitive." He also pointed to the high cost of die and machine maintenance and the superior flexibility of sand casting when minor engineering changes in patterns are required.

METALS TREND UP: Copper, lead, and zinc sales should perk up in 1961 even if there is

Foundry Statistics

Iron and Steel Scrap Consumption

(Gross tons[a])

	All Scrap Total	By Types of Furnace — Cupola Total	Air Total	Electric Total
1958	50,242,746	7,725,970	821,388	7,152,726
1959				
July	3,564,931	750,206	87,441	603,726
7 mo.	40,905,226	5,863,843	675,183	6,161,375
Aug.	1,875,165	691,786	81,184	374,678
Sept.	2,114,015	801,588	99,090	441,134
Oct.	2,266,709	798,569	98,279	445,137
Nov.	4,796,896	614,233	82,784	801,555
Dec.	7,021,870	843,040	99,577	1,008,158
Total	58,979,881	9,613,059	1,156,097	9,232,037
1960				
Jan.	7,043,483	823,442	95,442	1,058,189
Feb.	6,493,558	822,476	97,688	1,015,716
Mar.	6,655,569	839,016	106,749	974,535
Apr.	5,625,717	754,488	82,787	737,186
May	5,051,121	771,500	79,170	652,585
June	4,485,444	809,297	87,485	633,797
July	3,678,127	603,062	55,974	520,361
7 mo.	39,033,024	5,423,579	605,275	5,642,339

Index of Foundry Equipment Orders

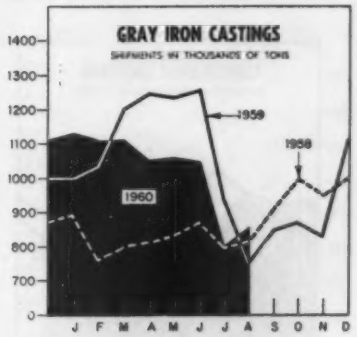
Foundry Trades Only

(Net Orders Closed, New Equipment)

	1959	1960
Jan.	127.4	95.5
Feb.	237.1	128.6
Mar.	166.6	139.9
Apr.	154.2	97.9
May	157.0	159.0
June	125.1	164.8
July	110.7	80.0
Aug.	134.1	92.4
Sept.	131.3	158.1
Oct.	140.8	....
Nov.	131.2	....
Dec.	95.9	....

Note: Base period 1947-49 taken as 100 per cent monthly average.

Source: Foundry Equipment Manufacturers Association.



GRAY IRON CASTINGS—SHIPMENTS

(Net tons[a])

	All Castings — Total	All Castings — For Sale	Miscellaneous Castings Total	Miscellaneous Castings For Sale	Nodular Iron Castings Total	Heavy Steel Ingot Molds Total	Chilled Railroad Car Wheels Total	Pressure Pipe & Fittings Total[b]	Soil Pipe & Fittings Total[b]	Unfilled Orders[c]
1958	10,357,504	5,849,426	6,146,186	2,648,005	117,558	1,884,396	265,114	1,277,685	784,123	.....
1959										
Aug.	742,420	505,612	484,678	253,466	11,046	13,482	18,479	145,853	79,928	872,903
8 mo.	8,645,975	4,844,442	5,189,104	2,167,421	111,179	1,643,659	236,706	970,282	606,212	.....
Sept.	848,899	527,001	584,669	278,591	11,875	19,416	16,272	142,660	75,882	853,278
Oct.	870,635	519,178	621,833	277,161	17,797	20,155	19,647	139,716	69,284	886,970
Nov.	830,360	514,888	492,742	249,576	12,698	165,139	16,723	96,086	59,670	853,368
Dec.	1,106,796	583,571	649,200	270,276	14,651	294,129	20,595	92,139	50,733	845,575
Total	12,301,781[d]	6,988,199	7,546,664	3,242,144	167,312	2,142,498	309,945	1,440,983	861,791	.....
1960										
Jan.	1,135,575	591,804	677,392	277,100	16,774	295,994	13,463	86,798	56,928	851,336
Feb.	1,107,721	571,143	678,927	279,190	16,430	284,738	17,848	76,332	49,576	858,224
Mar.	1,143,395	600,162	655,102	284,207	15,670	294,322	24,409	83,121	56,441	880,132
Apr.	1,051,357	580,599	609,234	258,994	13,980	232,895	21,737	118,886	63,605	834,496
May	1,052,798	588,770	613,745	257,180	13,126	207,094	20,414	136,455	75,090	781,506
June	1,049,639	601,597	622,236	273,148	15,010	183,049	19,810	144,773	79,770	719,564
July	803,306	450,580	478,269	202,347	10,694	120,784	16,226	120,650	67,375	754,789
Aug.	858,503	540,395	490,059	238,561	15,675	131,428	14,221	139,275	83,520	712,784
8 mo.	8,202,293	5,113,400	4,854,964	2,070,727	117,359	1,750,304	153,128	906,290	537,905	.....

Late News

no general business upswing. That's the prediction of Simon D. Strauss, vice president-sales, American Smelting & Refining Co. The reasons are 1) the three metals have done worse this year than the economy as a whole, and 2) a wave of stock cutting by consumers has shifted inventory from the hands of the consumer to the producer.

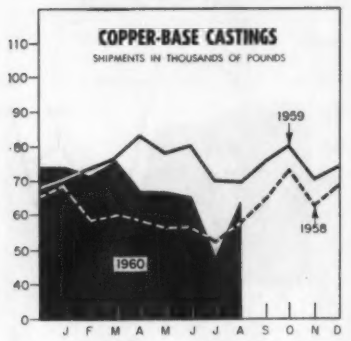
HEAT TRANSFER: Original research in the field of heat transfer will be conducted at Franklin Institute of Philadelphia under a commission from the American Foundrymen's Society. Purpose: To evaluate heat from high-temperature molten metals during the casting process. The work will be under the technical direction of the AFS Heat Transfer Committee.

FOUNDRIES MERGE: Triple A Metalcraft Corp. and H & S Metal Products Co., both Los Angeles producers of aluminum and magnesium castings, have merged. The surviving company is H & S Metal Products Co., 4159 Whiteside St., Los Angeles 63. Chief officers are: Chairman, C. J. Amick; president and general manager, Warren C. Smith; secretary and treasurer, Robert M. Allan.

Precision Metalsmiths Inc., Cleveland, will acquire Intricast Inc., Loudonville, Ohio, effective next Jan. 1. The acquisition will operate as Precision Metalsmiths Inc., Intricast Div., and with the main interest of producing low-cost high quality investment castings for commercial applications.

PERSONALS: Linwood A. Stedman has been named New England district manager, Pangborn Corp., Hagerstown, Md., succeeding John H. Connolly, retired . . . T. R. Elmblad has been appointed New York domestic manager, and A. C. Kukral, Cleveland manager, Whiting Corp., Harvey, Ill. R. J. Enroth moves from the Chicago to the New York office, and F. R. Schwantes from Chicago to Cleveland . . . . Cleveland Flux Co., Cleveland, has appointed Phil Sheridan sales representative in Pennsylvania, Ohio, and New York. He was with Eastern Malleable Iron Co. . . Thaddeus Giszczak, chief metallurgist, Defiance, Ohio, plant, Central Foundry Div., General Motors Corp., has been named divisional chief metallurgist,

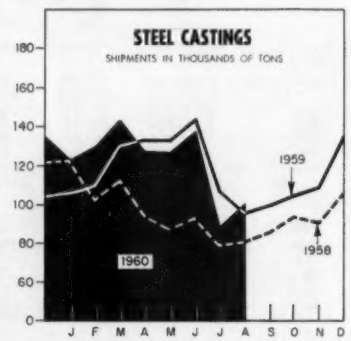
Foundry Statistics



COPPER-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments			
	Total	Sand	Perm. Mold	Unfilled Orders[2]
1958	762,484	697,360	31,854	.....
1959				
Aug.	66,531	57,949	4,359	32,117
8 mo.	581,022	512,971	33,452	.....
Sept.	73,290	63,813	4,758	29,396
Oct.	77,385	67,186	5,120	28,092
Nov.	68,255	59,094	4,840	29,147
Dec.	71,110	62,182	4,286	29,243
Total	871,032	765,246	52,456	.....
1960				
Jan.	73,971	65,742	3,915	26,053
Feb.	71,797	63,103	4,146	26,970
Mar.	75,908	66,517	4,346	27,470
Apr.	66,777	58,453	4,523	27,423
May	66,299	57,848	4,463	24,582
June	64,585	56,441	3,715	21,781
July	48,399	42,778	2,910	22,367
Aug.	63,765	56,344	3,669	21,915
8 mo.	531,501	467,226	31,787	.....



STEEL CASTINGS—SHIPMENTS

(Net tons[1])

	All Castings			Carbon			Alloy			
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Unfilled Orders[2]
1958	1,121,000	856,986	149,644	801,846	606,240	136,251	319,154	250,746	13,393	.....
1959										
Aug.	98,014	79,188	17,607	74,825	60,243	16,373	23,189	18,945	1,234	279,261
8 mo.	964,778	757,691	154,558	709,540	555,050	142,404	251,978	202,637	11,164	.....
Sept.	99,731	79,963	13,975	73,648	58,453	12,830	26,083	21,510	1,145	256,871
Oct.	105,570	84,850	11,819	80,127	63,901	10,978	25,443	20,108	841	268,874
Nov.	109,460	86,028	11,764	77,320	59,294	10,799	32,240	26,732	965	301,858
Dec.	133,346	104,138	18,868	99,643	77,517	17,200	33,703	26,621	1,668	306,346
Total	1,412,885	1,112,668	210,984	1,043,538	814,219	194,201	369,347	298,449	16,783	.....
1960										
Jan.	122,565	94,052	22,016	93,197	70,815	20,891	29,368	23,237	1,125	314,237
Feb.	129,250	97,927	26,532	96,888	72,963	25,328	32,371	24,964	1,204	279,684
Mar.	143,708	109,688	27,801	104,742	78,755	26,365	38,966	30,933	1,436	277,982
Apr.	127,219	96,557	26,101	93,433	70,251	24,526	33,786	26,306	1,575	248,902
May	126,580	97,231	26,793	93,709	71,808	25,324	32,880	25,423	1,469	252,293
June	136,992	107,076	29,155	101,294	78,601	27,503	35,698	28,475	1,682	233,765
July	89,565	67,294	16,196	63,753	47,570	15,570	25,812	19,724	626	223,880
Aug.	101,709	77,148	16,113	73,338	55,999	15,207	28,371	22,047	906	213,611
8 mo.	977,597	746,971	190,737	720,345	545,862	180,714	257,252	201,109	10,023	.....

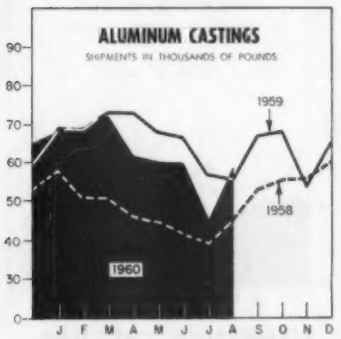
with headquarters at Saginaw, Mich. . . Richard Guiford has been named manager of Detroit Plastercast Foundry Co., Div. of Racine Foundry & Mfg. Co., Detroit. . . International Casting Corp., New Baltimore, Mich., has appointed Joseph Bertuglia production manager. Thomas Reid becomes superintendent of the foundry division. . . Norman F. Tisdale Jr. has been appointed executive vice president, Pittsburgh Metals Purifying Co., Mars, Pa.

INVESTS: An interest in the Taccone Corp., North East, Pa., builder of diaphragm type molding machines, has been acquired by Techno Fund Inc., Columbus, Ohio. The investment includes $300,000 in the firm's convertible debentures and $100,000 in its common stock. Clyde Williams & Co., Columbus, is management agency for Techno Fund Inc., which was organized under the Small Business Investment Act. It specialized in investments in the metals, chemical, electronics, instrument, and mechanical products field.

FREIGHT CARS SPURT: October orders for new freight cars totaled 5885, against 2061 in September and 2722 a year ago. Backlogs on Nov. 1 were 22,900 cars, off 13,299 from the total a year earlier.

MACHINE TOOLS: Net orders for metal forming type machine tools soared to a new peak for the year in October at $20.4 million, but demand for metal cutting type slumped. Gross orders for the latter totaled $43.6 million but cancellation of two large automobile programs cut net orders to $35.5 million, according to the National Machine Tool Builders' Association.

MISCELLANY: Training in industrial isotope radiography will be offered by Princeton Div., Curtiss-Wright Corp., Princeton, N. J., at its Nondestructive Testing Laboratories Jan. 30 through Feb. 3 . . . Bookings of industrial material handling equipment manufacturers dropped slightly in September, according to the index of the Material Handling Institute . . . Studebaker-Packard Corp. and Central Foundry Co. have terminated merger talks . . . Erie Bronze Co., Erie, Pa., has been appointed a licensed foundry by Ampco Metal Inc., Milwaukee . . . Arcair of Canada Ltd. has been formed with headquarters in Toronto.



PRODUCTION WORKERS

Estimated Number

	Aug. 1960	July 1960	Aug. 1959
Ferrous	178,700	187,100	194,100
Nonferrous	49,200	47,600	52,900

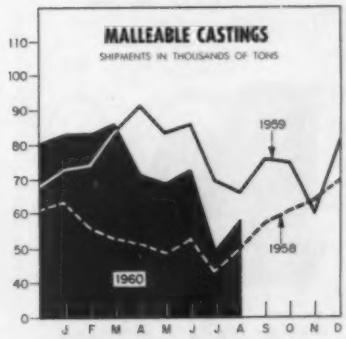
Average Weekly Earnings

Gray Iron	93.80	96.29	94.80
Malleable Iron	91.72	92.64	95.34
Steel	100.62	102.83	100.19
Nonferrous	101.56	101.81	99.39

Average Weekly Hours

Gray Iron	38.6	39.3	40.0
Malleable Iron	37.9	38.6	40.4
Steel	38.7	39.1	39.6
Nonferrous	40.3	40.4	40.9

Source: Bureau of Labor Statistics.



ALUMINUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments Total	Sand	Perm. Mold	Die	Unfilled Orders[2]
1958	641,700	125,487	224,092	290,275	.....
1959					
Aug.	56,041	11,074	18,102	26,733	82,488
8 mo.	532,530	93,706	194,054	243,794	.....
Sept.	66,331	12,254	21,783	32,154	81,839
Oct.	67,635	12,902	22,058	32,555	78,930
Nov.	54,695	10,757	16,604	27,219	84,392
Dec.	65,208	12,368	20,356	32,379	86,947
Total	786,399	141,987	274,855	368,101	.....
1960					
Jan.	68,247	11,278	22,368	34,514	92,109
Feb.	71,699	11,800	23,614	36,177	83,914
Mar.	72,216	12,934	22,413	36,749	78,024
Apr.	61,797	12,339	19,950	29,400	75,243
May	60,330	10,682	21,507	28,055	75,977
June	60,068	11,280	20,953	27,722	74,699
July	45,694	8,765	15,804	20,973	76,434
Aug.	58,647	10,639	18,850	29,106	75,230
8 mo.	498,698	89,717	165,459	242,786	.....

MALLEABLE IRON CASTINGS

(Shipments of castings—net tons[1])

	Shipments Total	For Sale	Standard Total	For Sale	Pearlitic Total	For Sale	Unfilled Orders[2]
1958	660,650	383,839	540,600	313,597	120,050	70,242	.....
1959							
Aug.	65,062	40,143	53,217	33,224	11,845	6,919	55,352
8 mo.	626,470	374,057	497,570	303,367	128,900	80,690	.....
Sept.	76,063	46,469	60,209	36,619	15,854	9,850	52,274
Oct.	75,511	48,625	61,683	40,088	13,828	8,537	55,031
Nov.	58,258	42,235	48,951	33,981	9,307	8,254	52,555
Dec.	80,060	45,917	61,455	35,891	18,605	10,026	93,874
Total	916,362	557,303	729,868	449,946	186,494	107,357	.....
1960							
Jan.	83,188	46,154	63,637	35,933	19,551	10,221	100,302
Feb.	83,118	46,850	64,131	37,391	18,987	9,459	98,272
Mar.	86,243	49,907	67,443	40,422	18,795	9,485	84,679
Apr.	71,271	39,059	56,136	32,066	15,135	6,993	79,237
May	68,942	37,618	53,106	30,126	15,834	7,492	73,240
June	72,593	43,105	55,956	34,526	16,637	8,579	63,920
July	49,860	28,575	37,187	22,477	12,673	6,098	74,329
Aug.	58,785	36,765	46,522	29,077	12,263	7,688	69,853
8 mo.	570,000	328,033	444,125	262,018	130,087	66,015	.....

Prices of Foundry Metals and Coke

(As of November 28, 1960)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE

Connellsville	$18.00-$18.50

OVEN

Birmingham	$30.35
Buffalo	32.00
Detroit	32.00
Erie, Pa.	32.00
Indianapolis	31.25
Kearney, N. J.	31.25
Milwaukee	32.00
Neville Island (Pittsburgh)	30.75
New England, deld.	33.55
New Haven, Conn.	31.00
Painesville, O.	32.00
Philadelphia	31.00
St. Louis	33.00
St. Paul	31.25
Swedeland, Pa.	31.00
Terre Haute, Ind.	31.25

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Boston, deld.	77.79	78.29
Buffalo	66.50	67.00
Chester, Pa.	Nom.	Nom.
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	68.40	68.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 28.25; tin bronze, No. 225, 38.00; No. 245, 32.50; high-leaded tin bronze, No. 305, 32.75; No. 1 yellow, No. 405, 25.50; manganese bronze, No. 421, 27.50.

ALUMINUM: Primary alloy No. 13, 25.90; No. 43, 26.20; No. 195, 27.60; No. 214, 31.50; No. 356, 26.80. Secondary No. 12 alloy, 22.75. Deoxidizing grades: No. 1, 23.75; No. 4, 21.00.

MAGNESIUM ALLOY: AZ91A, 40.75; AZ63A, AZ92A, AZ91C, 40.75, f.o.b. Velasco, Tex.

COPPER: Electrolytic 30.00, delivered Connecticut valley.
ZINC: High grade 14.35, delivered. Die casting alloy No. 3, 16.25; No. 2, 16.75, delivered.

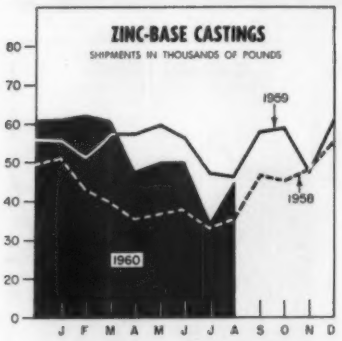
Iron and Steel Scrap

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Machinery Cast	Structurals, Plates	Malleable	Short Steel Rails
Birmingham	$28.00-29.00	$45.00-46.00	.....	.....	$36.00-37.00	.....	$44.00-45.00
Boston*	**23.00-24.00	**39.00-40.00	.....	**40.00-42.00	.....	.....	.....
Buffalo	23.00-24.00	**37.00-38.00	.....	**44.00-45.00	33.00-34.00	.....	42.00-43.00
Chicago	27.00-28.00	36.00-37.00	.....	41.00-42.00	32.00-33.00	40.00-41.00	42.00-44.00
Cincinnati*	**22.50-23.50	**34.00-35.00	**28.00-29.00	**44.00-45.00	.....	.....	**44.00-45.00
Cleveland	23.00-24.00	37.00-38.00	26.00-27.00	42.00-43.00	31.00-32.00	42.00-43.00	45.00-46.00
Detroit*	**17.00-18.00	**28.00-29.00	**21.00-22.00	.....	.....	.....	.....
Los Angeles	29.00	38.00-41.00	.....	.....	41.00	.....	.....
New York*	27.00-28.00	34.00-35.00	28.00-29.00	.....	31.00-32.00	.....	.....
Philadelphia	34.00	38.00	37.00	47.00-48.00	37.00-39.00	46.00	47.00-49.00
Pittsburgh	26.00-27.00	34.00-35.00	.....	47.00-48.00	32.00-34.00	.....	46.00-48.00
St. Louis*	27.00	38.00	31.00	.....	.....	.....	38.00
San Francisco	32.00	46.00-48.00	28.00	45.00-46.00	40.00	.....	.....
Seattle	**35.00	**35.00	**33.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

Foundry Statistics



ZINC-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1958	500,071	319,471	.....
1959			
Aug.	44,456	32,573	56,090
8 mo.	414,962	291,527	.....
Sept.	56,035	38,288	60,953
Oct.	57,106	40,487	57,514
Nov.	44,611	35,301	58,076
Dec.	58,496	37,406	65,723
Total	631,210	443,009	.....
1960			
Jan.	61,537	39,777	64,940
Feb.	62,925	42,089	66,945
Mar.	60,816	39,618	60,267
Apr.	47,553	31,423	56,312
May	50,844	33,551	56,654
June	50,809	34,264	51,960
July	35,117	25,186	52,392
Aug.	45,056	32,549	57,551
8 mo.	414,657	278,457	.....

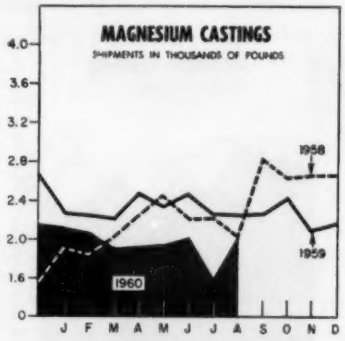
PIG IRON

PRODUCTION—Net Tons**

	Foundry	Malleable & Silvery	Low & Int. Low Phos. & Bessemer
1958	1,622,320	2,448,917	4,954,854
1959			
Aug.	N.A.	N.A.	N.A.
Sept.	N.A.	N.A.	N.A.
Oct.	N.A.	N.A.	N.A.
Nov.	148,660	180,927	216,063
Dec.	177,017	306,303	452,426
Totals[3]	1,889,445	2,810,359	3,471,553
1960			
Jan.	128,232	325,151	462,667
Feb.	148,238	338,866	471,755
Mar.	126,357	333,182	462,914
April	134,509	258,452	395,875
May	135,825	290,057	356,931
June	105,717	247,991	309,942
July	117,218	166,084	290,384
Aug.	78,950	171,718	211,506
Sept.	93,260	202,895	152,880
9 mo.	1,068,306	2,337,118	3,114,854

CONSUMPTION*—Gross Tons

	Cupola	Air	Electric
1958	3,314,652	169,267	231,145
1959			
July	311,327	16,391	20,437
7 mo.	2,402,196	134,900	259,374
Aug.	288,547	15,937	4,923
Sept.	336,015	18,057	6,033
Oct.	351,679	20,011	5,749
Nov.	276,168	16,350	28,231
Dec.	334,524	18,613	47,045
Total	3,989,129	223,868	351,355
1960			
Jan.	325,242	18,634	45,936
Feb.	322,945	19,257	42,883
Mar.	317,520	21,042	43,959
Apr.	282,178	16,796	36,971
May	292,407	15,730	19,869
June	313,340	16,828	23,720
July	241,752	11,892	21,123
7 mo.	2,098,384	120,179	234,461



MAGNESIUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1958	28,776	25,024	.....
1959			
Aug.	2,233	1,742	3,809
8 mo.	18,407	16,068	.....
Sept.	2,253	1,822	3,823
Oct.	2,426	1,580	3,501
Nov.	2,012	1,618	3,281
Dec.	2,184	1,721	3,423
Total	27,253	23,109	.....
1960			
Jan.	2,135	1,588	3,209
Feb.	2,075	1,679	3,278
Mar.	1,903	1,524	3,208
Apr.	1,926	1,533	3,138
May	1,953	1,514	2,948
June	2,050	1,555	3,396
July	1,638	1,234	3,541
Aug.	2,025	1,530	3,364
8 mo.	15,705	12,157	.....

*Source: U. S. Dept. of Interior Bureau of Mines: ** Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only. [3]Monthly figures do not add up to totals shown because of unreported monthly revisions.

Whitehead's
FINE SILICA SANDS
for Fine Finish Castings and Shell Molding

Whitehead offers the widest variety of fine washed and unwashed silica sands . . . all laboratory-tested in a Whitehead laboratory in each of the areas represented.

DIVIDING CREEK, New Jersey
Fine Washed Silica Sands

Retained on Sieve #	Grade D #71	Grade D Special #75	Grade E #96	Grade Overflow #118	Grade Superior #158
30	none	none	none	none	none
40	2.0	1.0	1.0	.2	.2
50	9.8	4.8	7.6	3.2	1.8
70	26.4	14.0	20.4	13.2	4.6
100	41.0	40.2	31.8	29.0	11.2
140	15.0	29.8	17.2	20.2	22.4
200	4.4	8.2	10.8	15.4	25.6
270	.8	1.2	5.6	8.8	14.0
Pan	.6	.8	5.6	10.0	20.2

McCONNELLSVILLE, New York
Fine Unwashed Silica Sands

Retained on Sieve #	#103	#130	#155	#180	#230	#275
30	.3	.2	none	none	none	none
40	.5	.2	.4	"	"	"
50	4.2	.4	1.4	"	.2	"
70	13.6	1.6	3.2	.4	.2	.2
100	26.1	12.4	10.2	2.5	.4	.6
140	25.7	32.8	22.0	18.0	4.0	1.2
200	20.8	37.2	30.0	35.9	21.4	6.4
270	5.5	9.8	14.2	17.4	21.4	11.2
Pan	3.3	5.4	16.8	23.8	46.4	80.4
Very Fine	none	none	1.8	2.0	6.0	

NEW ENGLAND
Marion Fine Washed Silica Sand AFSF #105

Sieve #	Retained
+6	none
12	"
20	"
30	"
40	.6
50	1.4
70	6.0
100	30.6
140	34.4
200	19.2
270	4.6
Pan	3.2

BLANEY, SOUTH CAROLINA
Washed Silica Sands

	55 B (50 — 60)	65 B (60 — 70)	80 B (70 — 95)	140 B (130 — Plus)	120 B (110— 135)
30	3.6	.4			
40	14.0	3.8	1.0		.5
50	27.7	15.6	6.6	.2	3.4
70	28.7	29.4	21.0	1.4	11.2
100	18.1	28.6	32.8	8.0	20.4
140	6.8	16.2	27.0	24.6	25.8
200	1.0	4.2	8.4	28.4	18.2
270	.1	1.4	2.4	21.8	12.1
Pan		.4	.8	15.6	8.2
AFS	51	68	82	161	121

LEADER IN FOUNDRY SANDS SINCE 1841

Whitehead Brothers COMPANY

Established 1841

NEW YORK OFFICE
324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
75 Westminster St., Providence 1, R. I.

Manufacturers of:

LYQUAGRIP
Ready-to-use core paste

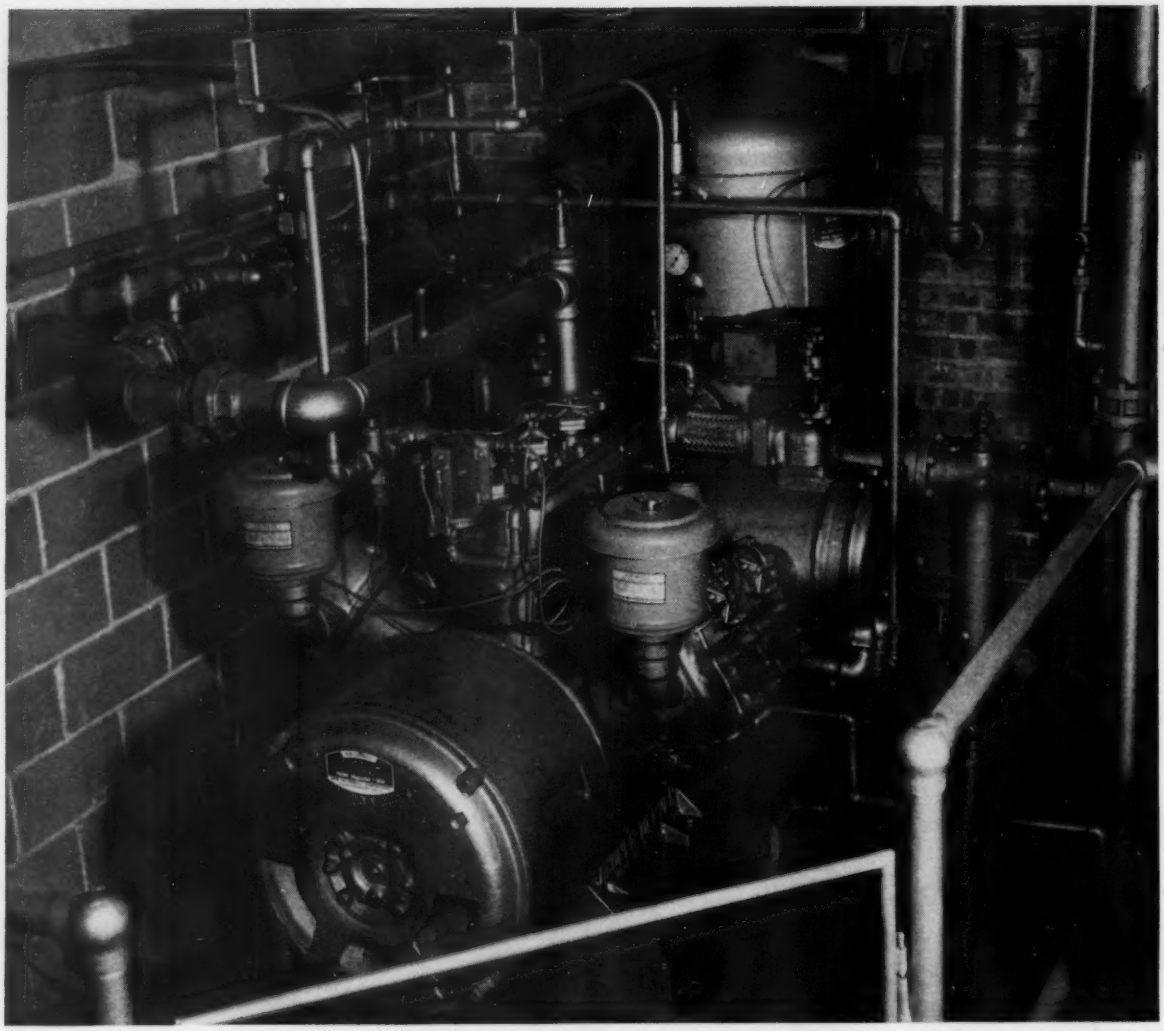
DUO RESIN
Binder for baking with controlled oven temperatures

JOINT-SEAL
Plastic compound for perfect sealing

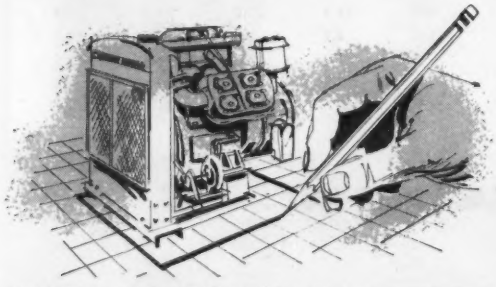
LYQUAFLOUR
For cleaner surface, better shakeout

LYQUAFACE
The liquid sand grain coating

Circle 578 on Page 55



Space-Saving Cost-Cutter—Gardner-Denver WB



SAVING YOUR FLOOR-SPACE DOLLARS—that's one more example of Gardner-Denver Engineering Foresight. Our engineers know your problems . . . design equipment to fit your needs. At Gardner-Denver there's no substitute for men—our philosophy as we enter our second century of service.

Here's everything you could want in an air compressor. And look how compact this space-saver is. Quickly spot it in a corner, hook it up, and it runs for years without the touch of a wrench.

The picture above is typical of a complete Gardner-Denver WB compressor package. Includes clean air aftercooler complete with moisture separator, air receiver and automatic controls.

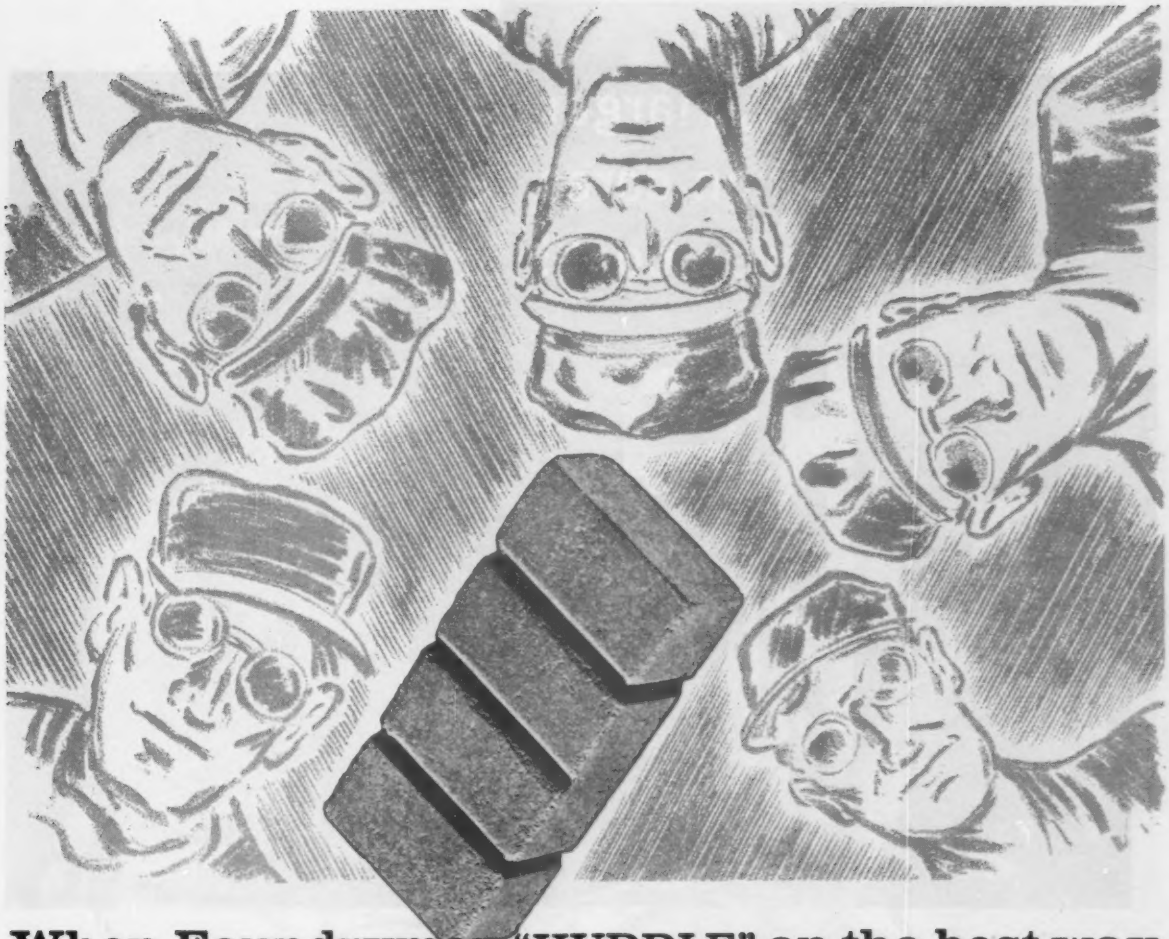
Save floor-space dollars and get a lasting supply of compressed air with a Gardner-Denver WB. Choose from seven sizes—142 to 1150 cfm piston displacement. Each size is a packaged unit that's easily and quickly installed without costly foundation work. Write for Bulletin WB-10 or consult your Gardner-Denver compressor specialist.

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario



When Foundrymen "HUDDLE" on the best way to get CLEANER IRON—they call for . . .

Famous CORNELL CUPOLA FLUX

for Gray Iron and Malleable Iron Foundries

Famous Cornell Cupola Flux is a special scientifically made combination of high grade fluorspar and other materials which create a chemical reaction in molten iron greatly increasing slag flow off. Drops are cleaner. Castings made from clean metal are therefore uniformly hard throughout making for better machinability. At your next plant "huddle" why don't you call for this famous flux.

The CLEVELAND FLUX Company

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Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

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Circle 580 on Page 55

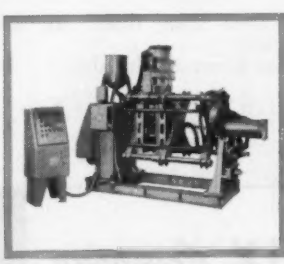
NOW... larger precision cores at lower cost!

...with a SPO fully automatic TOP BLOW holo-core machine

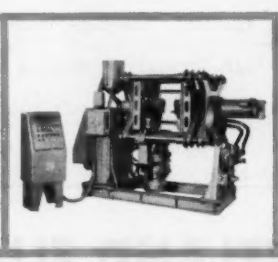
Model SC-100 has a blow capacity of 100 pounds of sand . . . will mass produce large single-cavity hollow cores or a wide range of small cores in multi-cavity boxes . . . cores are delivered ready-to-use in 90 seconds or less depending on complexity. Large platens take core boxes up to 24" x 30" x 14". Outstanding speed, simplicity, safety and economy are guaranteed operating advantages.

Other features include automatic gravity sand feed . . . integral direct-acting springless stripping mechanism . . . blow, dwell, drain-out and cure cycles that are timer-controlled and independently adjustable . . . gas-fired ovens are thermostatically controlled . . . simplified core box mounting . . . and shock-resistant heavy-duty construction throughout.

WORLD'S LARGEST SUPPLIERS SPO OF MOLDING MACHINES



SC-100 in Blow Position



SC-100 in Strip Position

Write today for your copy of Bulletin SC-200

SPO INCORPORATED

6449 Grand Division Ave. • Cleveland 25, Ohio

9009-SI

Circle 581 on Page 55

There's one exactly right for you...*Vancoram Chromium Alloys*

Because chromium improves steels and irons in so many ways, it has become one of the most economical and widely used alloying elements. Depending on the application and the percentage used, chromium imparts such properties as strength, hardness, toughness and corrosion resistance. The presence of chromium carbides also results in excellent cutting properties and wear resistance.

Naturally, for such a broad range of applications, no one alloy can serve for all uses; consequently, VCA produces more than thirty different chromium products, each tailored to do a specific job! The latest Vancoram Products list covers analyses and applications. VCA's technical staff will help you select the best for your needs. Just write or call your nearest VCA District Office. Vanadium Corporation of America, 420 Lexington Avenue, New York 17, N.Y. • Chicago • Cleveland • Detroit • Pittsburgh

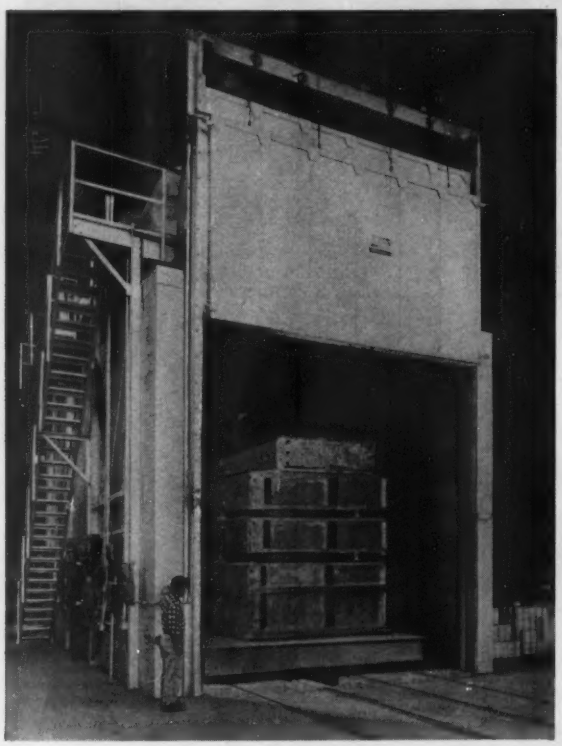
Stainless Steel

VANADIUM
CORPORATION OF AMERICA
Producers of alloys, metals and chemicals

VANCORAM

Circle 582 on Page 55

SURFACE DRY or "BONE" DRY
COLEMAN OVENS



Dry Molds Best!

Below: Two Coleman *JET-ACTION*® High Speed Mold Ovens in a gray iron foundry dry up to 60 molds per day.

Ingenious push button controls enable one operator to index cope and drag molds through the oven on a semi-continuous conveyor system. Ovens are heated by individual *JET-ACTION*® Recirculating Systems.

Coleman *JET-ACTION*® Ovens provide such benefits of dry sand practice as better casting finish—fidelity to pattern—lower cleaning costs with added advantages of reduced handling costs and accelerated flask turnover.

Above: Car-Type Mold Oven in leading steel foundry is one of the largest in the world. Door opening is 16 feet wide x 18 feet high; useful inside work space is 11,000 cubic feet!

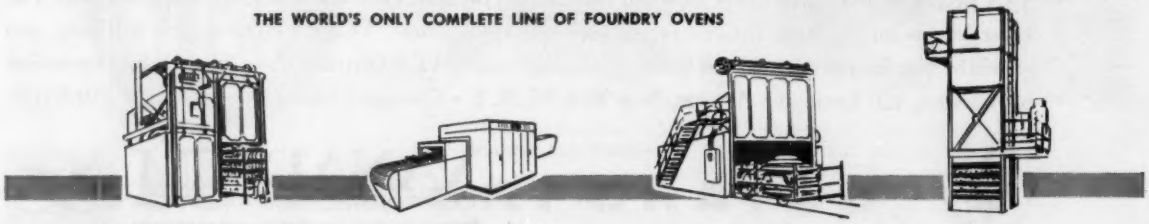
Combination gas and oil fired recirculating air system provides heating capacity to "bone" dry a 300 ton load of molds at temperatures up to 800° F. Heavy duty, sub-floor car moving system and doors at each end of oven are push button controlled.

Write for Bulletin 54.

THE FOUNDRY EQUIPMENT COMPANY • **1821 COLUMBUS ROAD, CLEVELAND 13, OHIO**

World's Oldest and Largest Foundry Oven Specialists — More than half a century of specialized foundry experience.

THE WORLD'S ONLY COMPLETE LINE OF FOUNDRY OVENS



TRANSRACK OVENS | **DIELECTRIC CORE OVENS** | **CAR TYPE OVENS** | **TOWER® OVENS**

Circle 583 on Page 55

interchangeable with all standard JIC cylinders

With the introduction of the ALL NEW T-J Squair Head, Tomkins-Johnson now offers industry the most complete design range of air and hydraulic cylinders. Presently available in bore diameters from 1½ to 8 inches, the T-J Squair Head is an interchangeable cylinder which produces maximum force and efficiency, with minimum pressures... and is also adaptable to the use of low pressure oil as the working medium. Write to The Tomkins-Johnson Co., Jackson, Michigan, for Bulletin #SQ 10-58 and complete details.

CHECK THESE 10 POINTS OF T-J SUPERIORITY

1 One Piece Piston

2 Hard Chrome Cylinder Bore and Piston Rods

3 High Tensile Steel Tie-Rods

4 Cushion Adjusting Screw, Externally Adjustable

5 New Super-Cushion for air, or Self-Aligning Master Seal for Oil (T-J Patents)

6 Solid Steel Heads and Mounting Plates Standard all Models

7 Port Design Allows Minimum Pressure Drop on Inlet or Outlet

8 "V" Type, Self-Adjusting Rod Packing

9 Piloted Packing Gland—Absolute Alignment

10 Piston Rod, Extra Strong—Polished and Chrome Plated for Efficiency and Protection

T-J TOMKINS-JOHNSON

Circle 584 on Page 55

How Bob Yochum solved 4 major grinding problems

It's easy enough to formulate a grinding wheel that will cut magnesium fast. But it's likely to leave a surface you could use for a nail file. And, when you formulate specially for fine finish, you're liable to get a wheel that loads up and glazes over like a skating rink. Then, if you concentrate on the glazing problem, you have to worry about the effect of excessive wheel wear.

Until recently, all these problems had at some time or another plagued the people at General Magnesium Foundry in St. Louis. Consequently, they were hopeful rather than expectant when they gave Bay State's Bob Yochum the job of working out a solution that would solve as many of them as possible.

Yochum put his extensive knowledge of metallurgy to work and spent a considerable amount of time at the foundry itself, studying every operation. Then he sent a detailed report of his findings and recommendations to Bay State's engineering staff in Westboro . . . and very shortly, General Magnesium had wheels for testing.

The results were more than satisfactory. The new wheels not only cut fast but, at 9,000 s.f.p.m., produced a 250 micro-inch finish **(rms)** on aluminum *and* magnesium castings of aircraft quality. They did not load and they lasted appreciably longer than the wheels they replaced.

This success story is typical of the way Bay State applies imaginative engineering to painstaking analysis of a specific problem. Your own Bay State distributor or direct representative is trained and equipped to do the same kind of job for you. *Better grinding at lower cost . . . that is his business.*

Examining a finished magnesium casting are (left to right) Jim Fischer, Manufacturing V. P. at General Magnesium, Bob Yochum of Bay State, Mel Belton, Plant Supervisor, and Ray Schneidewind, Quality Control.

Operator Charles F. Meyer finishes the edges of a large magnesium casting with Bay State's 16 x 2 x 1¼ high-speed, long-life, non-loading finishing wheel.

with 1 wheel for General Magnesium

After getting his engineering degree from the University of Missouri School of Mines & Metallurgy, Robert J. Yochum spent 6 years in the ship-building industry where he acquired a knowledge of metal-working techniques that was both extensive and intensive. Five years with Bay State have broadened his experience throughout the metal-working industries in general and given him a highly concentrated background in abrasive problems in particular.

BAY STATE ABRASIVES

BAY STATE
WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. *Distributors:* All principal cities.

Circle 585 on Page 55

Knight LETTER

ONE OF A SERIES

To: Foundry Management

Subject: Foundry Automation

"Why should we use the Knight organization to help us develop and carry out a foundry automation program?" is a question I am often asked.

There are, we think, a number of important reasons to use a qualified, "outside" engineering organization for this important planning. The Knight organization, for example:

1. Designed the first fully automated molding unit in 1949-50, producing up to 300 molds per hour with 5½ men producing what 53 did by the old mechanized method. Even today's new units do not exceed the performance of this equipment.
2. Developed the use of the segmented pattern which makes it practical to apply high production techniques to jobbing production problems.
3. Has designed many other "firsts" in the automated and semi-automated production units for bathtubs, sinks, soil pipe, fittings, automotive, electrical and other kinds and types of castings using flasks in sizes up to 4' x 10' x 4'.
4. Has key men who have visited more than 2,000 foundries in the United States and Canada, and 800 in Europe.
5. Becomes a part of your organization, temporarily, to bring highly specialized knowledge and training to develop the manufacturing approach best suited to your requirements, to achieve maximum utilization of manpower and equipment with most modern "rigging," and materials which insure maximum productivity, minimum investment, low operating costs and maximum profitability in highly competitive markets.
6. Insures the best working conditions, with buildings, equipment and services requiring minimum maintenance.
7. Provides an overall, long-range plan which may be achieved step-by-step, as conditions and finances warrant without duplication of expense.

Lester B. Knight

KNIGHT SERVICES INCLUDE:

Foundry Engineering • Architectural Engineering • Construction Management • Modernization • Mechanization • Automation • Survey of Facilities • Materials Handling • Methods Industrial Engineering • Wage Incentives • Cost Control • Standard Costs • Flexible Budgeting Production Control • Organization • Marketing

EVIDENCE OF EXPERIENCE

Lester B. Knight & Associates, Inc.

Management, Industrial and Plant Engineers

Member of the Association of Consulting Management Engineers, Inc.

549 W. Randolph St., Chicago 6, Ill.

New York Office—Lester B. Knight & Associates, Inc., Management Consultants, 500 Fifth Ave., New York 36
20111 James Couzens Highway, Detroit 35, Michigan
Knight Engineering Establishment (Vaduz), Zurich Branch, Dreikönigstrasse 21, Zurich, Switzerland
Lester B. Knight & Associates, G.M.B.H., Berliner Allee 47, Düsseldorf, Germany

Circle 585 on Page 55

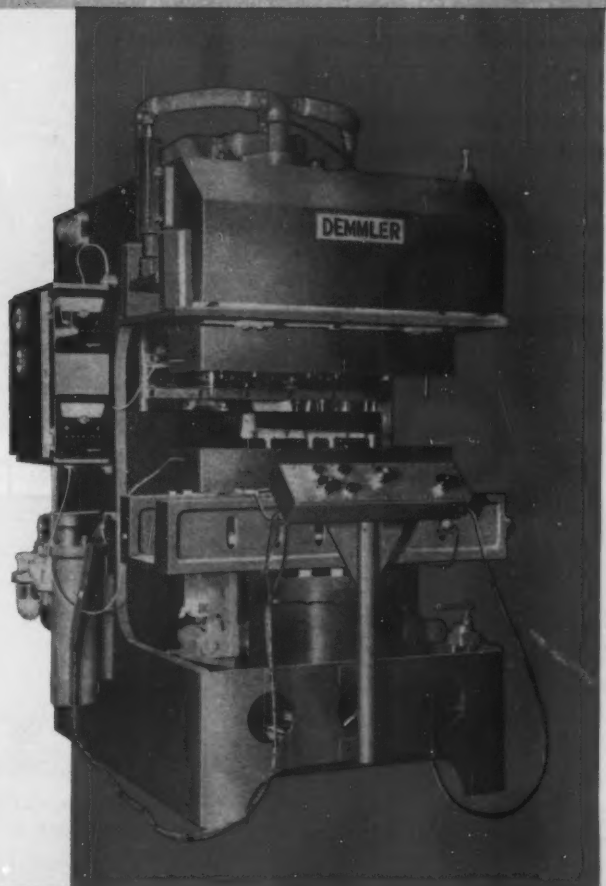
DEMMLER

simplicity
flexibility
dependability

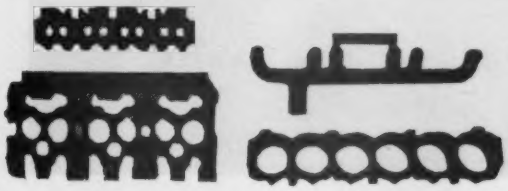
EDGE-BLOW CORE BLOWER

designed to blow furfuran or phenolic resin mixtures into gas-heated, temperature-controlled core boxes

DEMMLER advance-engineering has produced this high-production, low-maintenance edge-blow core blowing machine with fully-automatic cycle. Versatile, it blows cores from pin-type to 48" long. A new ejector feature lifts cores from core box easily without breakage. No rapping or vibration required. Its large capacity blow valve and air-receiver permits core-blowing pressures to 100 psi. Available in three sizes to fill a wide range of applications. Wire or write for additional details and quotation.



Typical cores produced by DEMMLER Edge-Blow machine:



DEMMLER
Manufacturing
Company
Kewanee, Illinois

Circle 626 on Page 55

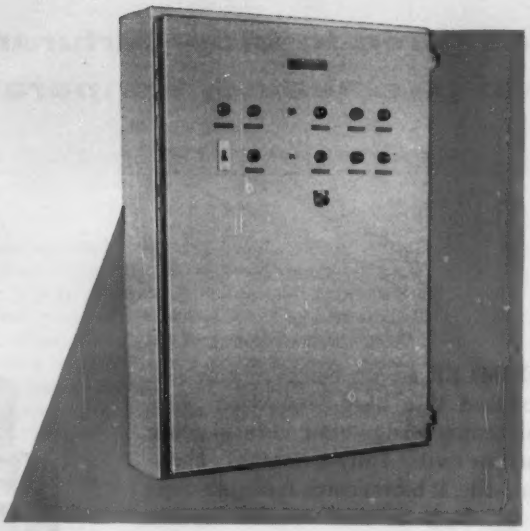
HARTLEY ▸ *the FIRST* *the FOREMOST* *the FINEST*

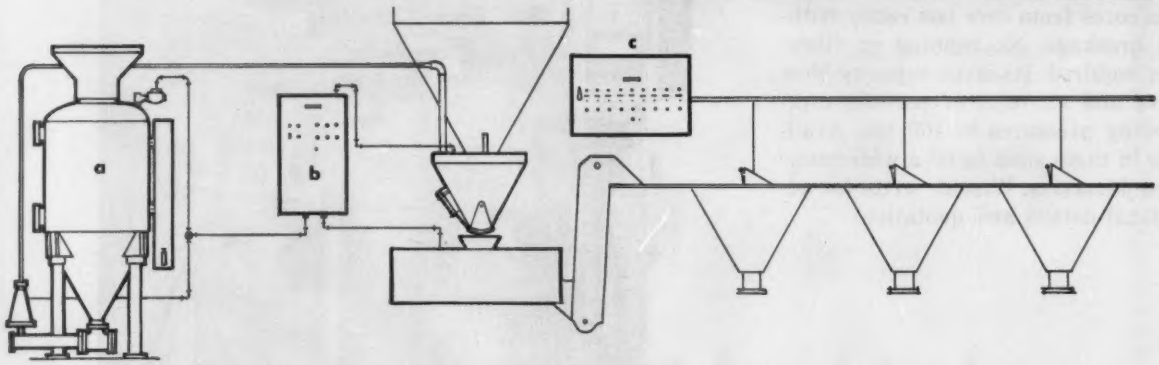
Hartley Sand Controller, Series XII, operates all — or any combination of:

Moisture Controls • Mixer Timers • Bond Feeders • Bin Controls • Mixer Selectors • Pneumatic Transporters

. . . *in complete Foundry Sand Automation*

● A single Hartley control cabinet *delivers* the precision impulses that remove guesswork, loss of time and lack of uniformity in foundry sand systems. From transporting raw sand to the control of moisture, bond additions and cycling in the sand reconditioning process, there is no waiting, no waste, no wondering. What's more, it is not necessary to automate your complete operation at once. Hartley equipment can be added and interlocked in stages. Let the savings from one unit pay for another until your sand system is fully automated.





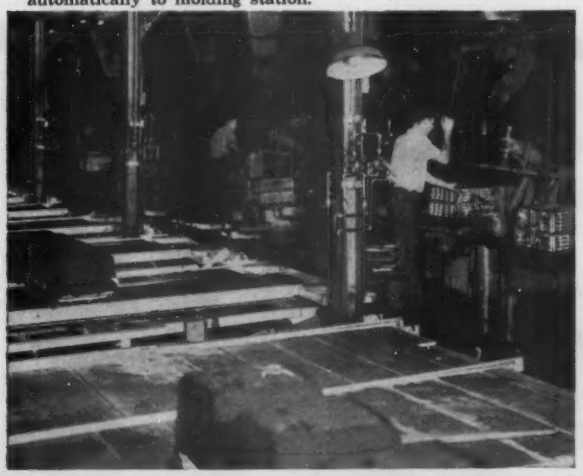
Line drawing shows a typical Hartley installation:
(a) Bond Feeder, (b) Series XII Sand Controller, (c) Sand Level Control.

Complete specifications and recommendations concerning special problems will be sent promptly.

HARTLEY *Controls* CORPORATION • NEENAH • WISCONSIN

Circle 626 on Page 55

TILT! Palletized molds ride Jeffrey pallet mold conveyor to dumping station. Operator tilts platform to dump sand and castings on Jeffrey vibrating pan conveyor. Operator reverses platform to roll pallet underneath pouring floor. Pallet returns automatically to molding station.



No manual handling in pouring operations. Ladles are carried on overhead trolley; palletized molds ride on Jeffrey conveyor. ▼

Mechanization with JEFFREY helps modernize foundry for 25% boost in production

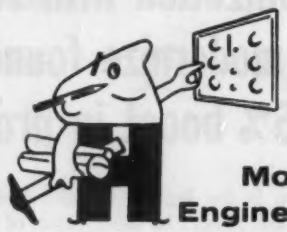
Automation is the key to foundry productivity and cost problems today. In recognition of that fact, The Deming Company, leading manufacturer of pumps and water systems, recently completed a thorough modernization of its iron foundry at Salem, Ohio.

Jeffrey foundry conveying and special handling equipment plays a big part in the 25% production increase—in the same physical plant—realized by eliminating manual handling and speeding operations. A big factor in equipment selection was the minimum maintenance experienced with Jeffrey units in operation since the plant was first built. In the words of Deming foundry management: "Jeffrey equipment is tops—well worth the added service it gives".

Jeffrey offers a complete service to foundries seeking greater productivity. We study the basic requirements, engineer the right conveying and processing equipment, handle erection if desired. In foundries, as in basic industry everywhere, it pays to consult Jeffrey. The Jeffrey Manufacturing Company, 907 North Fourth Street, Columbus 16, Ohio.

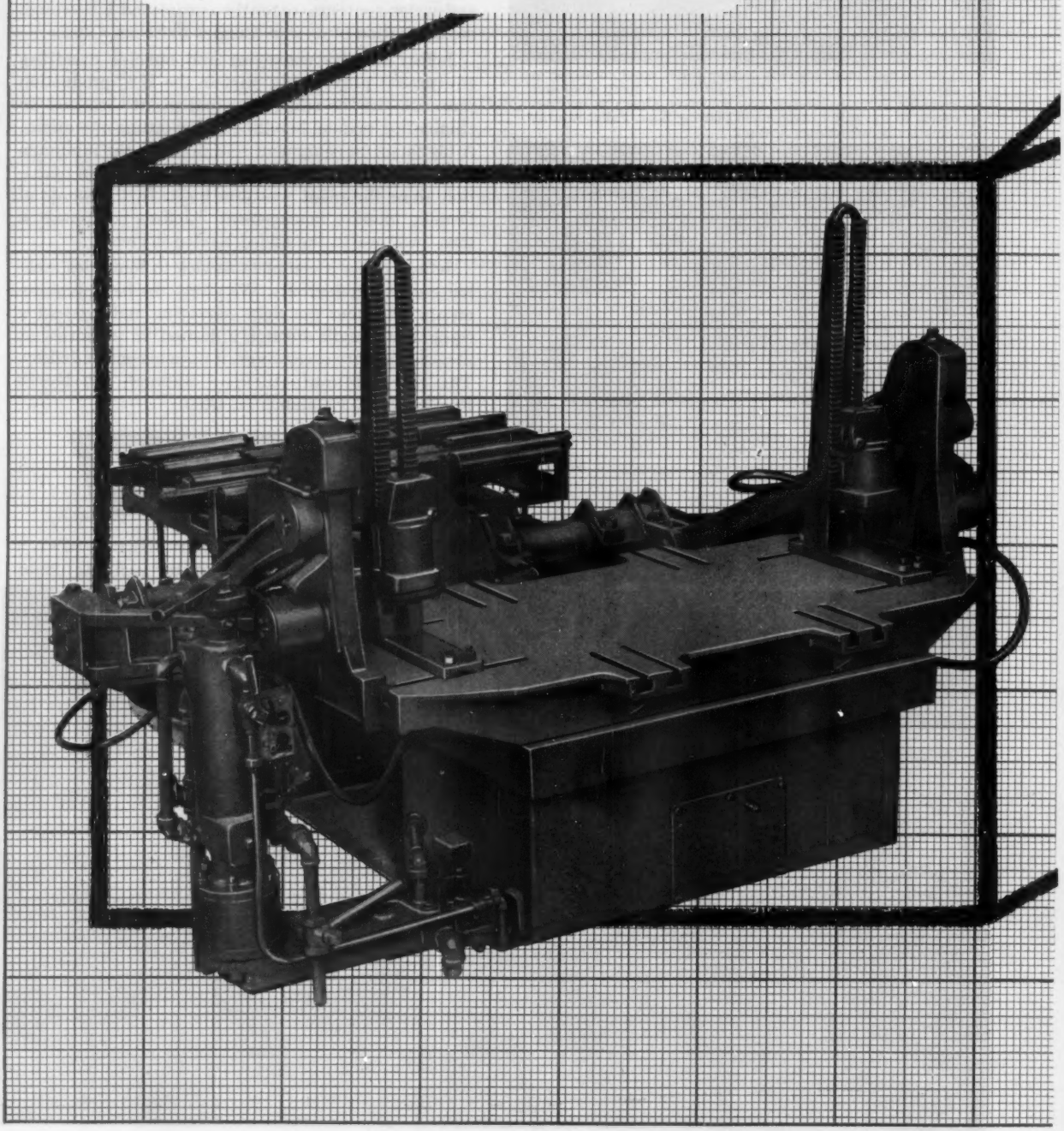
JEFFREY

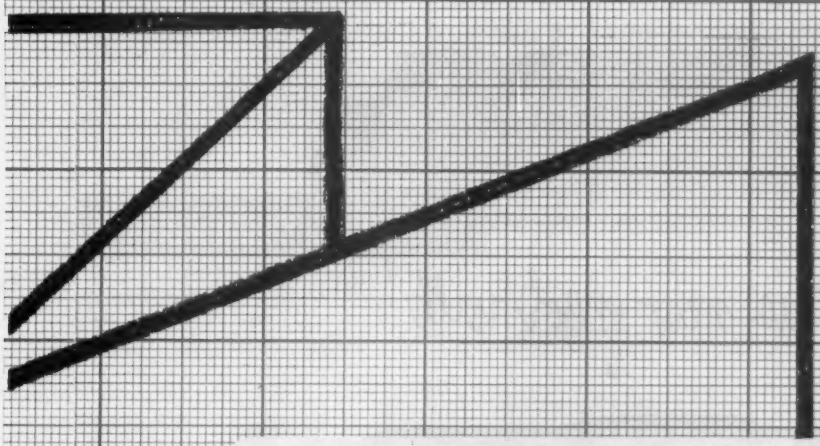
CONVEYING • PROCESSING • MINING EQUIPMENT...
TRANSMISSION MACHINERY... CONTRACT MANUFACTURING



HERMAN

Best Known and Most Progressive Name in Engineered Molding Machines





Completely engineered, completely assembled

The Herman 750-1500 lb. Jolt Rollover and Draw Machine

Cost-conscious foundrymen will welcome the fast installation possible with this Herman molding machine. The plus factors of good engineering have been made an integral part of this standard machine. It is completely assembled and, of course, no pit type foundation is required. All repairs are made at floor level.

All operations are controlled simply and easily by one rotary type valve. Jerking and slamming are eliminated by air-on-oil hydraulic controls.

A pattern draw equalizer overcomes any irregularities in the flask or bottom board. The machine makes perfect molds of any depth and deposits them directly on the discharge conveyor.

Countless other engineering features of this machine classify it as another in the complete Herman line which has been designed to do a better molding job, faster, for foundrymen everywhere.

To discuss cost reduction, fast amortization and improved facilities in your plant, a Herman Sales Engineer is near you.

Why not call him right now?

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

HERMAN PNEUMATIC MACHINE CO.
UNION BANK BUILDING, PITTSBURGH 22, PA.

3251-HP

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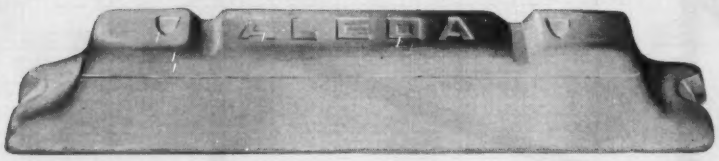
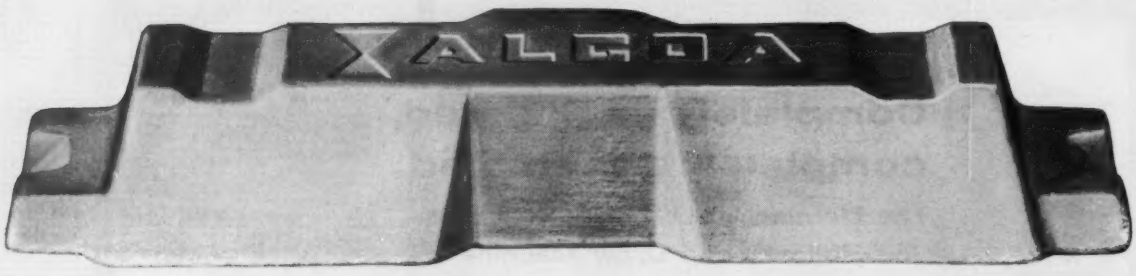
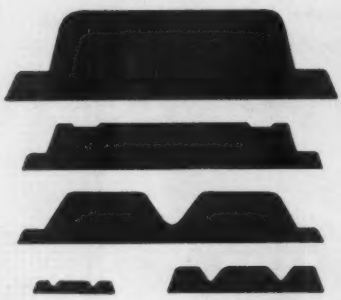
this little pig won't go to market...



but this new ingot will!



Alcoa Aluminum Ingot replaces pig and is now sold at pig prices!



Remember: the Alcoa "pig" is now an ingot—available in 700-, 50-, 30-, 10- and 6-lb sizes!

Primary aluminum products—once known as "pig"—will now be produced by Alcoa by methods formerly reserved for the production of aluminum ingot. Final step in a multimillion-dollar program recently completed by Alcoa to upgrade its basic metal, this will eliminate many of the problems encountered in casting and extruding.

Improved appearance, greater internal cleanliness and more uniform composition—all significant features—are *now available at the pig price level.* Foundries will be able to minimize costly fluxing and holding . . . cut down on rejects.

Remember the six bench marks of quality you get *only* from Alcoa with Alcoa® Aluminum Ingot: refined, clean, pure . . . sound, uniform, customized. With scientific ingenuity and research dollars, Alcoa applies realistic control of quality to reduce the costs of *your* finished products. For more information, call your nearest Alcoa sales office, or write: Aluminum Company of America, 2115-M Alcoa Building, Pittsburgh 19, Pa.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

FOUNDRY

Reader Information Service

Advertising content is classified by subject and listed by page number for your convenience when studying specific foundry applications. For further information on subjects advertised, refer to advertisement on the page indicated and circle Item Number on Reader Service Card —Page 55.

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FOUNDRY

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FOUNDRY

DECEMBER 1960

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412	442	472	502	532	562	592	622	652	682	712	742	772	802	832	862
413	443	473	503	533	563	593	623	653	683	713	743	773	803	833	863
414	444	474	504	534	564	594	624	654	684	714	744	774	804	834	864
415	445	475	505	535	565	595	625	655	685	715	745	775	805	835	865
416	446	476	506	536	566	596	626	656	686	716	746	776	806	836	866
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425	455	485	515	545	575	605	635	665	695	725	755	785	815	845	875
426	456	486	516	546	576	606	636	666	696	726	756	786	816	846	876
427	457	487	517	547	577	607	637	667	697	727	757	787	817	847	877
428	458	488	518	548	578	608	638	668	698	728	758	788	818	848	878
429	459	489	519	549	579	609	639	669	699	729	759	789	819	849	879
430	460	490	520	550	580	610	640	670	700	730	760	790	820	850	880

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FOUNDRY

DECEMBER 1960

401	431	461	491	521	551	581	611	641	671	701	731	761	791	821	851
402	432	462	492	522	552	582	612	642	672	702	732	762	792	822	852
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FIRST CLASS
Permit No. 36
CLEVELAND, OHIO

BUSINESS REPLY MAIL
No Postage Stamp Necessary if Mailed in the United States
—POSTAGE WILL BE PAID BY—

FOUNDRY
Penton Building
Cleveland 13, Ohio

Reader's Service Dept.

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FOUNDRY
Penton Building
Cleveland 13, Ohio

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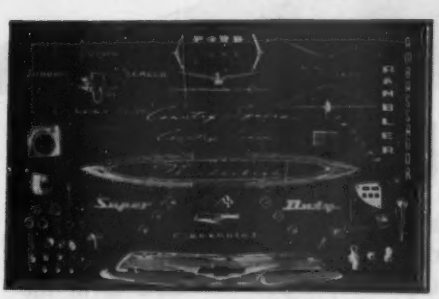
50 million castings a year

PUTTING THE NEW CARS IN TRIM FOR READY SALES

At the TRILEX CORPORATION, Wayne, Mich., this efficient battery of 14 KUX Hot Chamber Die Casting Machines (400- and 600-ton) is part of the complete Trilex facilities for modern die casting, fully automatic plating, finishing, and assembling.



from these KUX die casting machines

"THE PRIMARY concern of the major automobile manufacturers for die-cast trim parts is *quality*," says John Airey, president of Trilex Corporation, important suppliers in the automotive and appliance field. "That's why we have use KUX Die Casting Machines since 1945. They produce hardware finish quality castings.

"But along with quality," Mr. Airey continues, "auto makers as well as appliance men consider *price*. We've found that KUX machines can be depended on for minimum maintenance and minimum downtime. They put us in a better position to compete on a cost-per-unit basis."

Whether your main concern is lower production costs, higher quality or both, investigate the advantages of KUX Die Casting Machines. 28 all-new strain gauge proven KUX models, 50 to 2000 tons, for both hot or cold chamber operation, available with automatic cycling mechanism and KUX patented "Vac-U-Die" and "Auto Feed" systems of vacuum die casting.

Write for full details of the 28 all-new KUX models illustrated in the latest KUX Die Casting Machine Catalog.

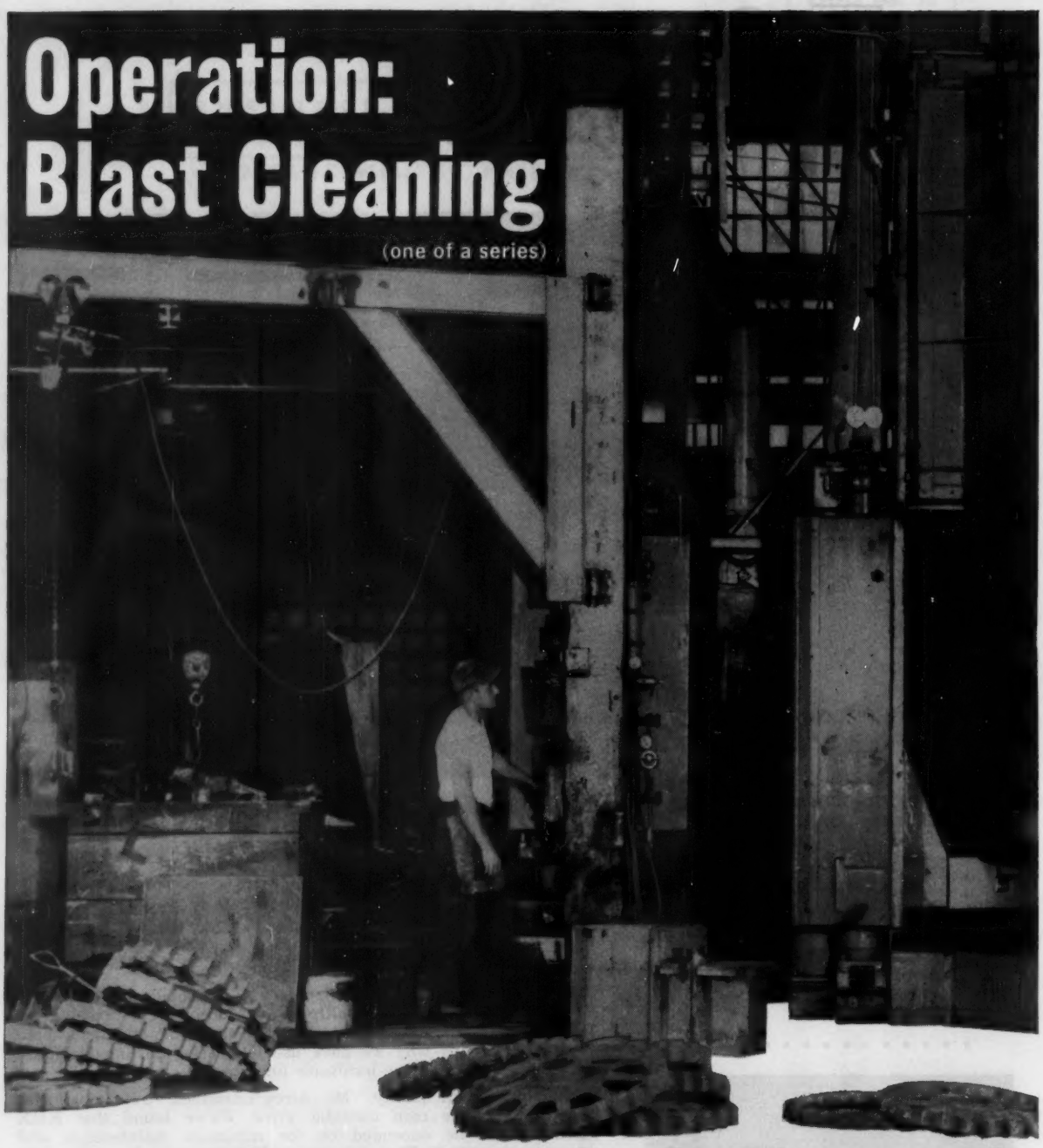
KUX MACHINE CO.

6725 North Ridge Avenue, Chicago 26, Illinois

Circle 592 on Page 55

Operation: Blast Cleaning

(one of a series)



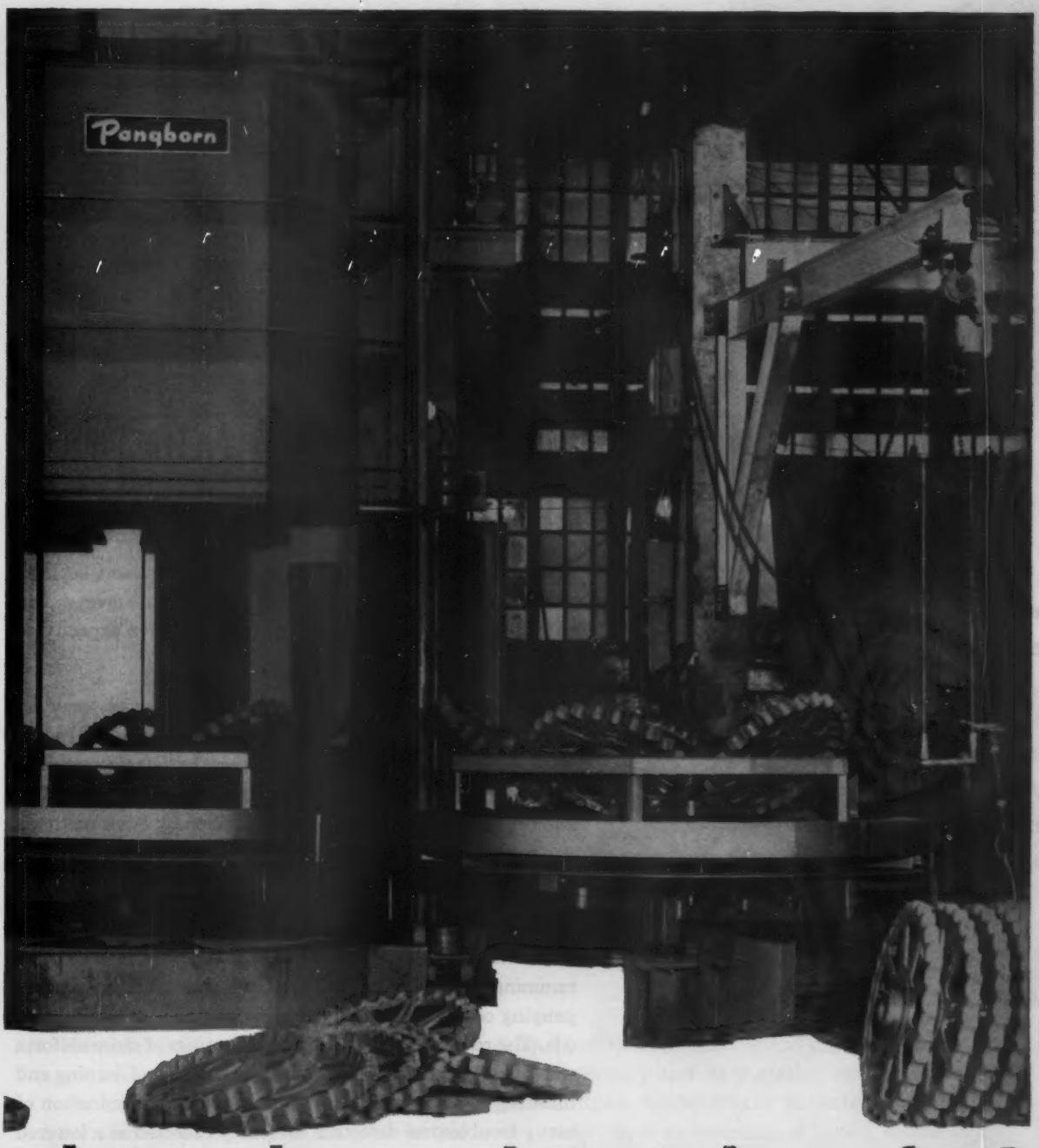
Twin-table Rotoblast hurls 50 tons of

Here's why the Pangborn Rotoblast "LM" Table Room doubled the capacity of the cleaning department at Harrison Steel Castings Co., Attica, Ind.

Inside the "LM" Table Room two Rotoblast Wheels throw 100,000 lbs. of abrasive at the castings every hour. This is blast power at its best. The abrasive hurled in a pattern designed to clean thoroughly every spot on every casting, even on bulky pieces up to 8′ in diameter.

During the cleaning process, castings rest on a rotating work table which increases the efficiency of the blast pattern. While one table is in the machine, its twin is being loaded outside. This makes for quick, continuous operation.

The tables are accessible from all sides (an exclusive Pangborn feature). They handle easily and can be pushed by hand with little effort. In the loading process, their weight is supported by a stationary



shot per hour... cleans twice as fast!

floor pedestal—rather than door hinges—for long life and trouble-free operation.

If the Pangborn "LM" Table Room has doubled the capacity of Harrison's cleaning department, it can do the same at your plant. For complete information write to: PANGBORN CORPORATION, 1400 Pangborn Boulevard, Hagerstown, Maryland. *Manufacturers of Blast Cleaning and Dust Control Equipment—Rotoblast® Steel Shot and Grit.* ™

Let Rotoblast abrasives cut your cleaning costs.
A special heat treating process makes Rotoblast Steel Shot and Grit solid and tough, so that they can stand up to much more punishment than ordinary abrasives. Since they last longer, they can make many more passes than run-of-the-mill abrasives. Rotoblast Steel Shot & Grit can reduce your abrasive replacement costs considerably, and thereby decrease your cleaning costs.

Pangborn
OF HAGERSTOWN

Circle 593 on Page 55

GREATER SAVINGS FOR YOU WITH

No other molding method can match the advantages offered by the foundry-proved Slinger. Not only does the Slinger offer essential quality advantages, but the Slinger method also provides maximum productive capacity per worker, per dollar, per square foot of floor space. The Slinger offers maximum flexibility in foundries where frequent pattern changes and wide differences in flask sizes are necessary during a day's operation. These changes may be made without interruption to production and this results in appreciable man-hour savings.

B&P SANDSLINGERS®

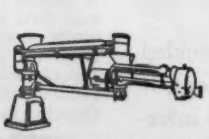
In addition, a wide range of auxiliary equipment such as Rol-A-Draw and Roto-Mold turntable or loop conveyor can be added at any time to extend the productive capacity of your Slinger installation.

For Production or Jobbing Foundries — Sandslingers Provide Outstanding Ramming Capacity — Greater Flexibility

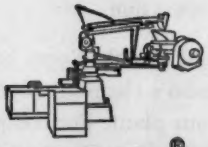
Slingers are not limited as to the mold size that may be rammed. They offer a complete line of Sandslingers, Hydra-Slingers, Speedslingers and Autoslingers that attain ramming capacities of from 700 to over 2000 pounds of sand per minute, assuring productivity not attained by other methods . . . regardless of the basis of comparison.

The Sandslinger's hard uniform ramming assures high mold hardness over the entire pattern face, on vertical as well as horizontal surfaces. Because of the uniformity of Slinger ramming, permeability will be much higher than that accompanying comparable mold hardness attained by other methods. The results are truer-to-pattern castings of more uniform weight and of greatly improved surface quality. Cleaning and finishing costs are markedly reduced, and the elimination of many troublesome defects is favorably reflected in a lowered scrap rate.

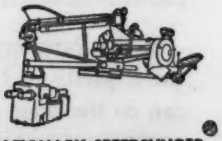
A SLINGER FOR EVERY JOB



STATIONARY SANDSLINGER®



HYDRA-SLINGER®



STATIONARY SPEEDSLINGER®

BETTER METHODS FROM B & P RESEARCH

The Slinger is the world's most versatile molding device. No other unit serves as wide a range of application at as low an installation cost. Slingers are very widely used to ram both molds and cores. There is no need to change existing equipment in adapting a foundry operation to the Slinger method. Slingers handle all types of patterns—either wood or metal—and all types of flask equipment.

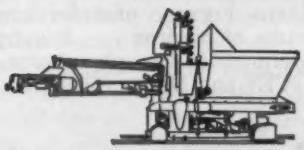
The flexible Slingers can be used independently or with a wide range of auxiliary equipment such as the Rol-A-Draw and roller conveyor or, as shown here, the Roto-Mold turntable. No matter what your requirements, jobbing, semi-production or production, the Slinger either independently or teamed with other equipment will provide quality and productivity unapproached by any other molding method.

Where, due to the size of flasks or other conditions, it is not feasible to move flasks to a ramming station, the Motive Sandslinger, Motive Hydra-Slinger or Motive Speedslinger is recommended. The great range of operation built into these machines makes them truly applicable to the widest possible variety of jobbing foundry production . . . and these Slingers offer ample ramming capacities for the biggest job.

Beardsley & Piper sales representatives are well equipped through training and experience to aid in your selection of a Slinger. These men consider each foundry and its operating conditions before recommending the model of Sandslinger, Hydra-Slinger, Speedslinger or Autoslinger to be installed. Their experience, reflected in this recommendation, is an assurance of lasting satisfaction, and this experience together with that of the engineering organization behind them, is at your call—no obligation, of course.

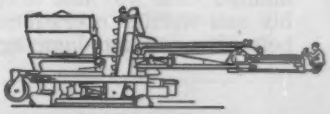
Circle 594 on Page 55

AUTOSLINGER®



MOTIVE SANDSLINGER®

MOTIVE HYDRA-SLINGER®

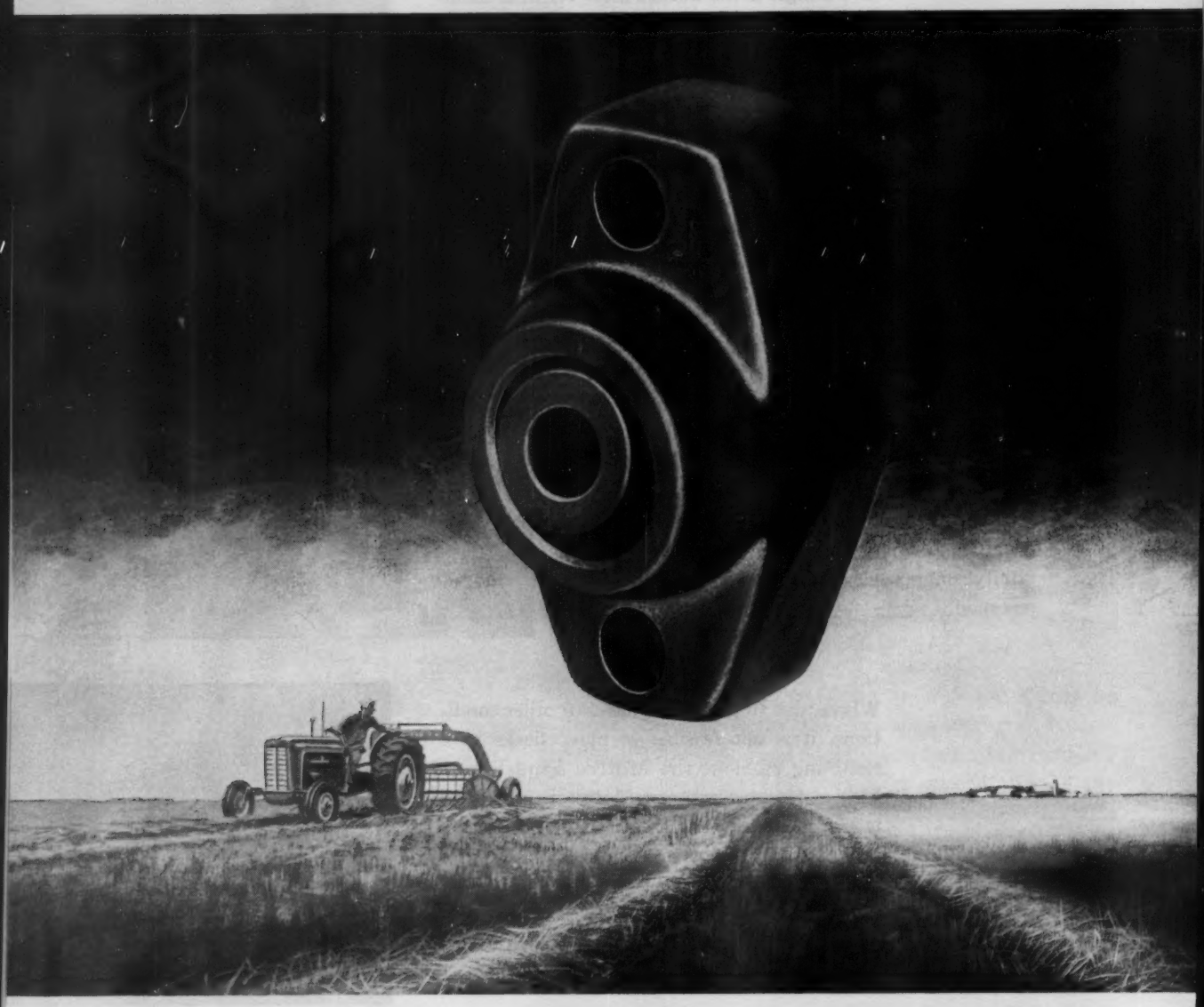


MOTIVE SPEEDSLINGER®

BEARDSLEY & PIPER Div. of Pettibone Mulliken Corp. 2424 N. Cicero Ave., Chicago 39, Ill.

FEMA

How the Foundry Industry Serves America . . . #11 of a Series



IRON CASTING REPLACES WELDMENT IN SWIVEL FASTENER, CUTS COST 80%

Originally this swivel fastener was made as a weldment of two pieces of steel. Twelve separate operations in shearing, trimming, piercing, breaking, drilling, assembling and welding were required. The fabrication cost of $1.88, added to a material cost of 66¢, resulted in a total piece cost of $2.54.

By utilizing gray iron's ability to be cast in intricate shapes as a single unit even around a ball bushing, the manufacturer was able to eliminate the costly assembly and welding operations. And the part possessed better wearing and damping properties. After the conversion to gray iron, the simplified unit was fabricated and delivered by the foundry at a ready-to-go cost of only 52¢ each.

This is just another example of how modern iron castings can solve many of the problems of industrial design and effect substantial manufacturing savings.

For the production of structurally sound iron castings, Hanna Furnace provides foundries with all regular grades of pig iron . . . foundry, malleable, Bessemer, intermediate low phosphorus, as well as HANNATITE® and Hanna Silvery.

Facts from files of Gray Iron Founders' Society, Inc.

HANNA
THE BEST KNOWN NAME IN IRON

THE HANNA FURNACE CORPORATION

Buffalo • Detroit • New York • Philadelphia

Hanna Furnace is a division of **NATIONAL STEEL CORPORATION**

Circle 595 on Page 55

Readers' Comment

Reading Requires Study

To THE EDITORS:

During my vacation I had the opportunity to catch up on some of my reading, particularly the last several issues of FOUNDRY magazine. There were several excellent and thought-provoking articles.

As I review them in my mind, I realize that there has been an important change in our literature in the last few years, and this is exemplified by your excellent publication. No longer is foundry literature something to be read in our idle moments while relaxing after a hard day's work (physical or mental). Much of it requires an alert mind for full comprehension and considerable contemplation in respect to our individual problems in order to be of value.

Unfortunately, not many foundrymen can devote working hours to reading, and so one of our best methods of learning and keeping will informed is not fully utilized.

CHARLES F. WALTON
Technical Director
Gray Iron Founders' Society
National City-E. 6th Bldg.
Cleveland 14, *Ohio*

Transportation and Foundries

TO THE EDITOR:

Since all products require transportation, it is interesting to know the considerations which influence cost levels of transportation services. And transportation costs become very important when supervising for the best possible efficiency.

Obviously, the transportation agency is engaged in selling the use of space in its vehicles, and the weight density of any commodity determines in some degree revenue to be derived from its transportation, since freight rates are usually levied per hundredweight. Other factors than weight density on which freight rates are based include value per pound of a commodity; liability to damage or theft; method of packing; and state of manufacture of the article, raw materials usually enjoying lower freight rates than finished products.

Because foundry products present most favorable transportation characteristics in all these particulars, this condition should be apparent in the level of freight rates applying to them.

Inbound foundry materials generally are of low value and of substantial weight density, outbound products still represent relatively low values and attractive weight density, and claims for damages are practically unknown. Such transportation characteristics justify expectation of the lower freight rates generally accorded shipments of that character.

If you are experiencing relatively high charges on the commodities with which you deal, there is a means to present your appeal for a readjustment of freight rates that will accord your shipments equitable treatment. Both truck and rail managements maintain standing committees to whom all shipper requests for freight rate adjustments are referred, and shipper representatives are given full opportunity to be heard at public sessions, conveniently arranged.

Also, the classification committees maintain regularly scheduled hearings to consider any proposed revision of classification ratings or rules.

L. E. WHITNEY
Traffic Counsel
Westover Corp & Associates
Milwaukee 10, *Wis.*

Helpful Information

To THE EDITORS:

We in the Art Department (sculpture) at the State University of Iowa are planning to build a separate building which will include a foundry for the purpose of casting art objects in various metals.

It has been my duty to design the foundry and get an estimate of the equipment and materials needed. Your magazine's reader's service is a simple solution to the many sources of information I need to obtain.

ALEXANDER SOROKA
Graduate Assistant
Department of Art
State University of Iowa
Iowa City, Iowa

In the interest of the American foundry industry, this ad (see opposite page) will also appear in

STEEL
IRON AGE
MODERN CASTINGS
AMERICAN METAL MARKET

FREE!

REPRINTS OF THIS AD WITH YOUR FIRM'S SIGNATURE

If you would like to have reprints of this ad to mail to your customers and prospects, let us know. Reprints will have no Hanna product message or signature, but will be imprinted with your firm name and address. Absolutely no obligation. To order your reprints, fill in and mail the coupon below.

The Hanna Furnace Corporation
Detroit 29, Michigan

Please send me_____ reprints of Ad No. _____ (No.) ____ of your Foundry Industry Series.

Imprint as follows:

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Send reprints to:

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I understand there is no charge for this service.

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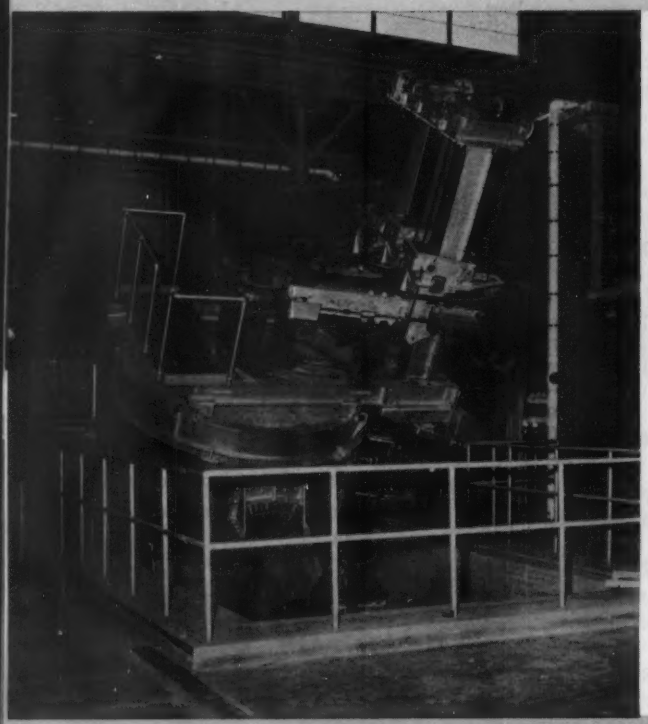
SWINDELL

The advanced electric furnace design and experienced plant engineering that assure increased productivity and profits for modern foundry operations



Do you have our Swindell Electric Arc Melting Furnace Brochure? Free on request— 36 pages of data and pictures. Write!

SWINDELL-DRESSLER CORPORATION

ENGINEERS • CONSTRUCTION • MANUFACTURERS

PITTSBURGH 30, PA

The SWINDELL-DRESSLER CORPORATION of Canada, Ltd.
Ottawa, Canada

SUBSIDIARY OF PULLMAN INCORPORATED

Circle 596 on Page 55

FOUNDRY
DECEMBER 1960

Quality a Must

Much has been written and said about the need for effective quality control in the casting process. There are times, however, when one wonders whether the subject has received the attention it deserves. Certainly the constant pressure from users of castings for improved quality indicates that some foundries either do not appreciate the importance of keeping a tight rein on their operating practices or have been unsuccessful in maintaining that control.

The nature of the casting process offers many opportunities for something to go wrong, with consequent impairment of quality and lack of uniformity from one piece to the next. This situation should make it mandatory that the foundry employ a more comprehensive system of checks than is required in most other manufacturing operations.

A factor that is bringing increased demand from consumers for higher quality is the rising cost of processing defective castings. Automated machinery is expensive, and downtime and rearrangement of production schedules caused by poor-quality castings are proportionately costly.

It should not be difficult for a foundry to determine the amount of money it is losing in the form of scrap castings and customer rejects. In many instances it will be found that this money would more than pay for the cost of an efficient quality control system.

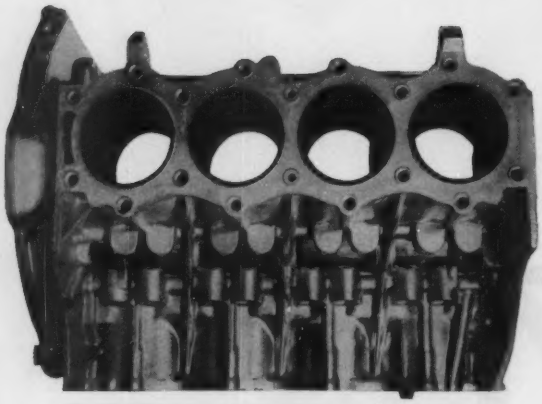
Buyers of castings also can calculate the costs they incur when processing parts of inferior quality. Such data carry considerable weight when the buyer is making a choice of his source of castings.

Modern laboratory equipment, inspection devices, and procedures can keep foundry variables in line, but only if they are tools of a carefully planned and well executed inspection system.

Once a foundry has established what it considers to be a satisfactory system of tests and inspection, its task of controlling quality is only partially completed. The system should be checked regularly to determine its effectiveness and to seek ways to improve it. Inspection methods should be designed so that presence of trouble is uncovered long before thousands of rejectable castings have streamed into a customer's plant.

An outmoded and inadequate inspection system means nothing but trouble under today's competitive conditions.

William G. Reichelt
Editor



Completed V-8 aluminum block casting as it appears before machining. The centrifugally-cast gray iron cylinder liners can be distinguished clearly

GM's Compact V-8 Uses

Permanent Molded Block and Heads

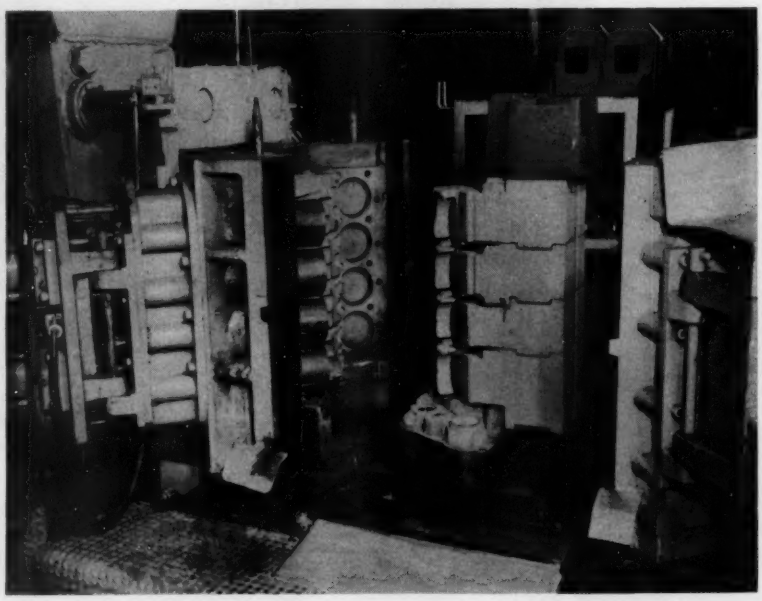
Complicated, hydraulically-operated permanent molds have retractable mandrels which facilitate the casting of gray iron cylinder liners in the aluminum block for GM's new compact V-8 engine

● THE COMPACT V-8 engine used in the Buick Special, Oldsmobile F-85, and as optional equipment in the Pontiac Tempest, uses about 122 lb of cast iron parts and 107 lb of aluminum castings. Cast parts comprise 228.7 lb or about 72 per cent of the 318-lb total weight of the 155-hp engine.

Table I shows a breakdown of the cast parts. It is interesting to note that the crankshaft is about two-thirds the weight of the aluminum block, which has iron liners, and that the two cylinder heads are about two-thirds the weight of the crankshaft.

Sand Cores Used—Production of the blocks is of particular interest. They are cast in hydraulically-operated permanent molds, with sand cores positioned in the mold cavity to form the water jackets and crankcase. Centrifugally-cast gray iron cylinder liners are heated, placed in the mold, and cast integrally with the block.

The liners are held in position during pouring by mandrels which are retracted later to permit opening of the mold and removal of the cast block. Blocks are cast on end. When the two side mold segments are withdrawn, the casting rests on a third segment which forms the bell housing in the block. The cast block is removed from the mold segment by hoist and hook arrangement.



Four crank case sand cores and the pouring basin sit on lower section of the permanent mold. At left, four gray iron cylinder liners are on mandrels in extended position. Liners on the opposite side are shown in the retracted position

TABLE I—Cast Parts Used in the GMC Compact V-8 Engine

Casting	Quantity	Molding Method	Net Weight, lb
Gray Iron			
Camshaft	1	shell mold	6.670
Balance weight	1	green sand	2.436
Camshaft sprocket	1	green sand	1.220
Crankshaft cap	5	green sand	7.650
Balance flange	1	green sand	3.000
Flywheel	1	green sand	21.000
Clutch pressure plate	1	green sand	7.447
Exhaust manifold, right	1	green sand	12.950
Exhaust manifold, left	1	green sand	11.246
Cylinder liner	8	centrifugal	10.000
Pearlitic Malleable Iron			
Crankshaft (ArmaSteel)	1	green sand	38.390
Aluminum			
Cylinder block	1	permanent mold	48.280
Cylinder head	2	permanent mold	26.036
Piston	8	permanent mold	6.800
Intake manifold	1	permanent mold	10.950
Flywheel housing	1	diecast	6.040
Shaft bracket	8	diecast	0.656
Water pump cover	1	diecast	1.130
Valve rocker arm	16	diecast	1.600
Water outlet	1	diecast	0.365
Impeller assembly	1	diecast	0.188
Timing chain cover	1	diecast	3.880
Oil pump cover	1	diecast	0.670
Throttle bearing	2	diecast	0.123
		Total castings, lb	228.735

Fixture at top positions water jacket sand cores in the mold

Cylinder heads for the valve-in-head engine are cast in smaller permanent mold machines. Sand cores are placed in the mold to form the water jacket and ports.

Cores for the block and heads are blown on standard machines. The sand mix contains a urea resin binder.

Melting—Aluminum alloy 356 is prepared in four gas-fired 40,000-lb reverberatory furnaces. The molten metal is transferred to 1700-lb, gas-fired holding furnaces at the molding platforms and tapped into 100-lb pouring ladles as needed.

When the castings have cooled, gates, risers, and sprue are removed in automatic transfer machines. Following machining, the block and head castings are placed in a continuous heat treat oven and given an aging treatment for 4 hr at approximately 400°F to relieve stresses and provide dimensional stability.

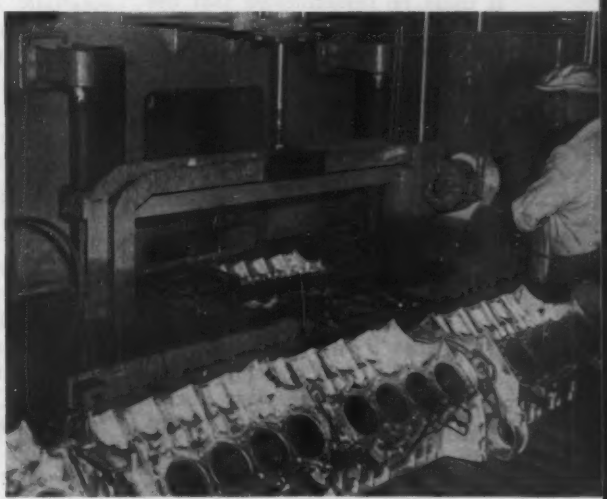
Reliability of the castings is controlled by a series of quality checks. Metallurgical control is maintained by frequent physical property tests and quantometer analyses. The castings are gaged for dimensional accuracy and submerged in water for pressure testing with compressed air.

Block castings are processed through an automatic qualifying machine which establishes the starting points for machining. Blocks are given a final quality check on a specially designed gaging machine which checks 22 dimensionally critical points.

● For an extra copy of this article, until supply is exhausted, use card on Page 55

A hook and hoist arrangement is used to remove the block casting from the bottom segment of the mold

Block castings are pressure tested under water by compressed air during a series of quality checks



GATING MALLEABLE IRON

This article, number fifteen in our series on gating and risering, explains the various factors to be considered when designing a proper gating system for a malleable iron casting

● TO THE CASUAL nontechnical observer, a finished casting shows little evidence of the complicated system of sprues, runners, gates, and risers that are used to produce the part.

In the past, the methods employed to permit the flow of molten metal from the pouring ladle to its final point of solidification in the mold cavity often were considered an integral part of the molder's individual art. Gating and risering was, therefore, carried out in a manner that gave only a limited indication that the existence of underlying, fundamentally scientific, principles had been recognized, much less applied.

A great amount of time and money has been spent recently, both here and abroad, on basic studies of gating and risering techniques. It could be demonstrated that the flow of molten metals in confined channels of molding sand can be likened to the flow of water in a pipe. In other words, the problem of properly gating and risering a casting is one involving hydraulics or fluid mechanics.

Since Wallace[1] has so aptly stated that "an understanding of the application of Bernoulli's theorem and surface tension, adhesion, and viscosity principles is nearly all that is necessary to control hydraulics," it will be the principal purpose of the subsequent discussion to elucidate how much of this data can be applied to malleable iron.

It is generally agreed that a gating system which is efficient and adequate must be designed to meet the following requirements:

1. Promote a smooth transfer of molten metal from the pouring cup to the mold and aid in the removal of entrapped slag.
2. Minimize turbulence in the mold cavity.
3. Establish desirable thermal gradients in the system which will promote directional solidification and sound castings.
4. Reduce the velocity of the stream of metal to avoid any washing of mold or core sand.

It is recognized that castings made from nondrossing metals may not need the meticulous attention to detail required of gating systems designed for aluminum or magnesium. However, the ever-increasing emphasis on high-integrity parts makes it mandatory that the foundryman understand fully how modifications in design of the gating system components affect flow conditions and casting quality.

The pertinent hydraulic principles involved—and these are operative for malleable as well as the other cast materials of construction—have been summarized in the first paper in this series[2].

Flow Characteristics Change—It is important to recognize that the characteristics of flow change in the hydraulic system during pouring, because back pressure develops as both the gating system and the mold cavity fill. If the gating system is choked at the outset so that it is pressurized, in effect, from the beginning of pouring, this change may be quite insignificant except for the last instant in which the mold cavity is filled.

As far as the practical foundryman is concerned, conditions prevailing during the initial stages of metal transfer from the ladle to the mold are most significant with respect to the ultimate quality of the casting.

The secret of designing a good gating system is to assure metal transfer from the pouring ladle to the mold cavity at a rate slow enough to avoid serious turbulence and erosion, yet fast enough to prevent cold shuts and misruns and other casting defects.

The gating system must be correct technically so that it can be filled completely and quickly, before any metal enters the mold cavity, and can be kept full during the pouring of the mold. Since an economic factor enters most operating considerations, the question of casting yield should not be overlooked.

Pouring Rate Factors—Ladle (or pouring lip) height exerts some influence on pouring rate and satisfactory operation of the gating system. If a level between 6 and 15 in. above the mold is maintained, the effect on flow is not serious. It can be visualized readily that with excessive height of the lip, inaccuracies are encountered which may lead to intermittent pouring and severe turbulence in the pouring

CASTINGS

By HANS J. HEINE
Technical Director
Malleable Founders' Society
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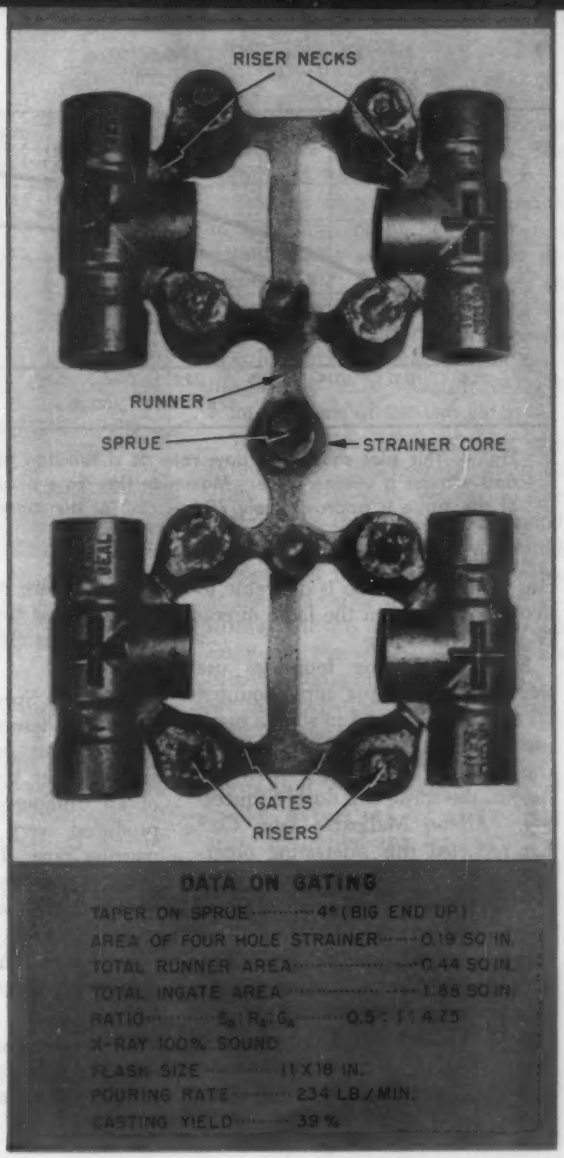
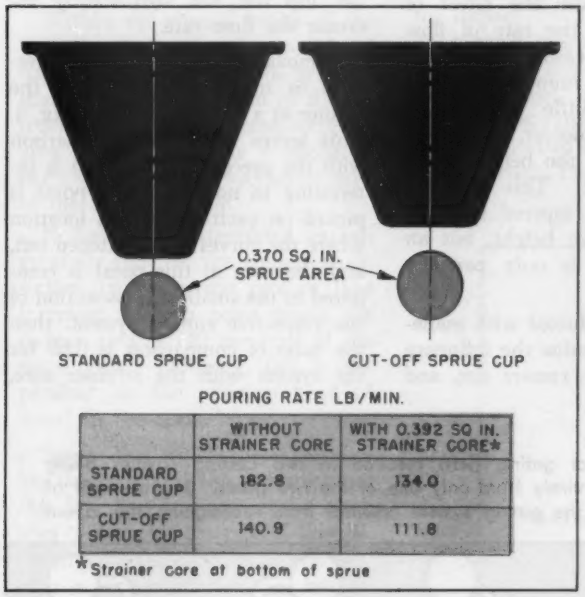

RISER NECKS
RUNNER
SPRUE
STRAINER CORE
GATES
RISERS
DATA ON GATING
TAPER ON SPRUE ..... 4° (BIG END UP)
AREA OF FOUR HOLE STRAINER ..... 0.19 SQ IN.
TOTAL RUNNER AREA ..... 0.44 SQ IN.
TOTAL INGATE AREA ..... 1.88 SQ IN.
RATIO ..... $S_a : R_a : G_a$ ..... 0.5 : 1 : 4.75
X-RAY 100% SOUND
FLASK SIZE ..... 11 X 18 IN.
POURING RATE ..... 234 LB / MIN.
CASTING YIELD ..... 39 %

Fig. 1—This gating and risering system is typical for malleable iron. The terminology of gating and risering is illustrated by the system in the photo



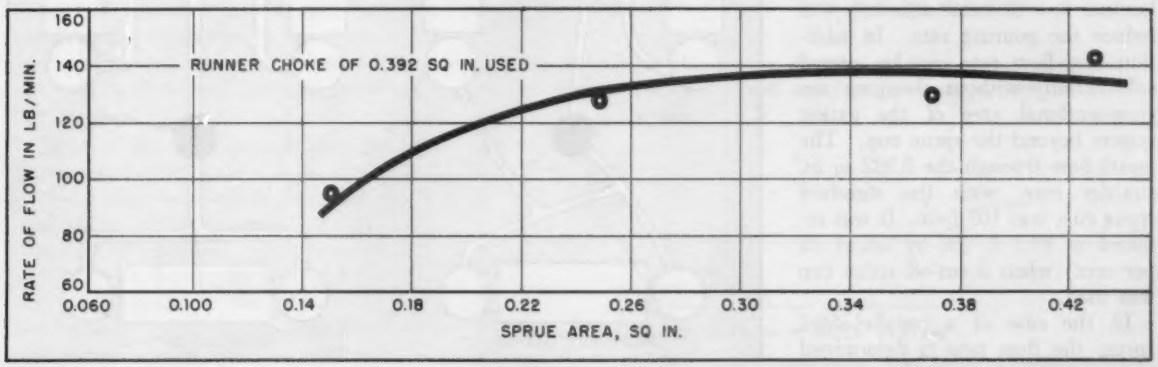
POURING RATE LB/MIN.

	WITHOUT STRAINER CORE	WITH 0.392 SQ IN. STRAINER CORE*
STANDARD SPRUE CUP	182.8	134.0
CUT-OFF SPRUE CUP	140.9	111.8

*Strainer core at bottom of sprue

Fig. 2—Lower flow rates result whenever strainer cores or cut-off sprue cups are added to a system

Fig. 3—As cross-sectional area of a sprue is increased and becomes equal to the opening area in a strainer core, the flow rate curve flattens out



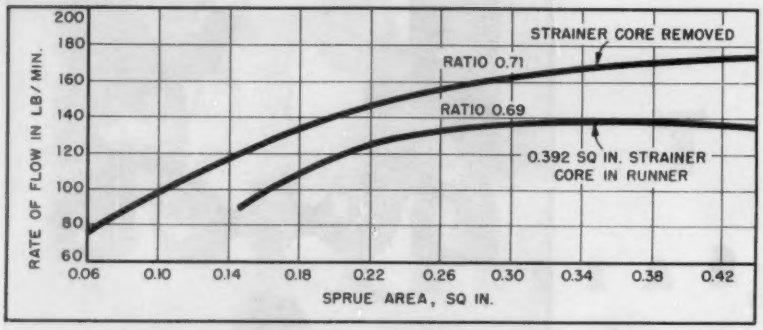


Fig. 4—This plot shows the flow rate as a function of sprue area with and without a strainer core. Maximum flow rate occurs when the area of the sprue is approximately 70 per cent of the runner area

cup or basin. It also is desirable to avoid pouring from the ladle directly down the sprue.

Many production foundries use molded rubber sprue cups mounted on the squeeze board in such a manner that the metal sprue post on the pattern is lined up with the hole in the sprue cup during squeezing. Albion Malleable Iron Co.[3] has reported this interesting observation:

"In a check using a standard sprue cup with an 11/16-in.-diam sprue post, the pouring time, both with and without a strainer core in the runner, was checked with a stop watch. The bottom of the cup then was cut off so that a very abrupt step was created. Pouring times were checked again. The results showed, as seen in Fig. 2, that the rate of flow with the standard-shape sprue cup is noticeably better. The cut-off sprue cup reduced the pouring rate to 76 per cent of that of the standard cup without the strainer core, and to 83 per cent of the standard cup when the strainer core was used."

This simple test illustrates two important facts: Any shape of sprue cup which disrupts the smooth, laminar flow of metal definitely will reduce the pouring rate. In addition, the flow rate can be altered substantially without changing the cross-sectional area of the gating system beyond the sprue cup. The metal flow through the 0.392 sq in. strainer core, with the standard sprue cup, was 103 fpm. It was reduced to 87.3 ft (or by about 15 per cent) when a cut-off sprue cup was used.

In the case of a parallel-sided sprue, the flow rate is determined by the square root of the height of metal in the sprue cup. This relationship was changed by the design described.

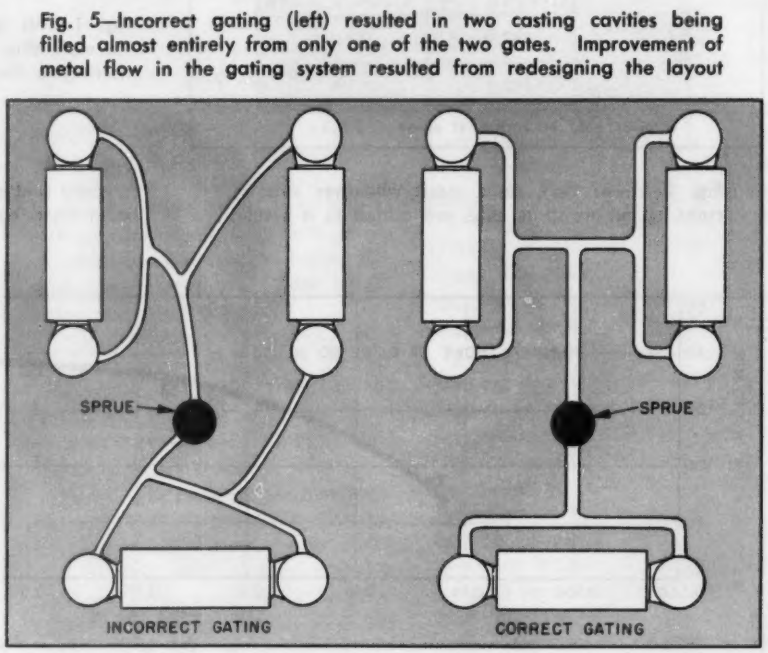
Effect of Sprue Height — Tests made to determine the effect of sprue height on the rate of flow showed that increasing the height of an untapered round sprue post produced very little increase in pouring rate. However, with a tapered sprue post, the height has a pronounced effect. This variation occurs because a tapered sprue is filled for its entire height, but an untapered sprue is only partially filled.

Tests were conducted with malleable iron to determine the influence of sprue diameter, runner size, and runner chokes on the rate of flow. A production type round sprue of variable diameter was employed. This sprue had an inverse taper, big-end down with a taper of approximately 1 degree per side. A choke of 0.392 sq in. was positioned in the runner (cross-sectional area 0.47 sq in.). The results of these tests are shown in Fig. 3.

It is observed that as the cross-sectional area of the sprue at the top is increased to an area equal to the strainer core openings, the flow rate curve practically has flattened out. This shows that the sprue area acted as an effective choke until equal to the strainer core area. When this sprue area exceeded the strainer core area, however, the choking was performed by the strainer core and further increases in the sprue area at the top did not significantly increase the flow rate.

Removal of the strainer core results in unobstructed flow in the runner at a rate indicated in Fig. 4. This serves as a valid comparison with the preceding graph. It is interesting to note that if a point is picked on each curve at a location where the curves have flattened out, and the area at this point is compared to the smallest cross-section of the respective runner system, then the ratio of comparison is 0.69 for the system with the strainer core,

Fig. 5—Incorrect gating (left) resulted in two casting cavities being filled almost entirely from only one of the two gates. Improvement of metal flow in the gating system resulted from redesigning the layout



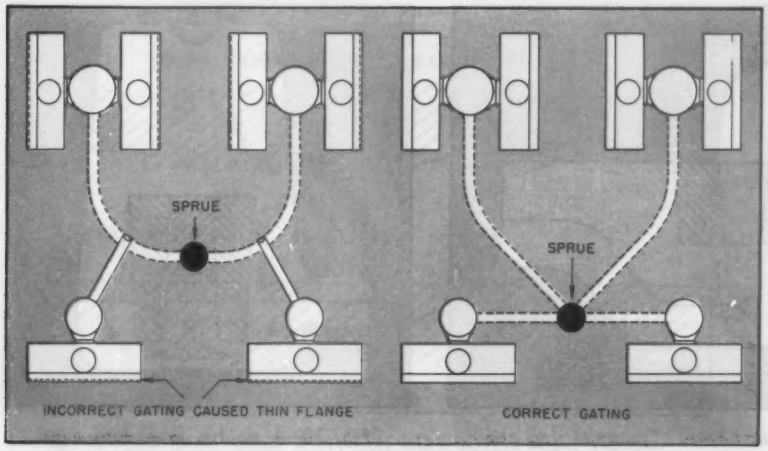


Fig. 6—Vertical flanges of right angle brackets (bottom, left) fill incompletely because these cavities are fed by runners in the cope. Full feeding of the castings results from improved runner design (right)

and 0.71 without the strainer core.

Within the control limits of the test, the ratios can be considered equal. From this it can be assumed that near-maximum rate of flow is reached when the cross-sectional area of a round sprue is about 70 per cent of the cross-sectional area of the runner system.

It has been determined experimentally that, as the runner cross-section increases, the rate of flow increases up to a point where the runner area is 140 per cent of the sprue area. However, this is dependent on the effective head of metal in the sprue cup.

Sprue Acts as Choke—Considering the results of this investigation, the foundryman apparently often tries to decrease the rate of flow by choking runner systems, when possibly a very effective choke has already been established by the sprue itself. Again, this statement should be qualified to emphasize that it is dependent upon the relative length of both the runner and the sprue. Economical factors also should be considered. Decreasing the cross-sectional area of the sprue to reduce the rate of flow, will increase casting yield.

Some of the preceding articles in the current series have shown that, as the molten iron reaches the bottom of the sprue, potential energy has been changed into kinetic energy. To break the nearly free fall of the metal at the bottom of the sprue in parallel-sided and big-end-down tapered systems, strainer cores commonly are used to absorb the impact.

To avoid turbulence and possible concomitant erosion and entrained slag and dirt, the cross-sectional area at the runner system can be increased to two or three times that of the sprue. The strainer core will act as a choke at the base of the sprue and assist in keeping the sprue and runner full.

Another important consideration in any discussion of metal flow in a gating system is the control of direction. Fig. 5, left, illustrates an inherently poor pattern layout that resulted in an extremely uneven flow and in two of the casting cavities being filled almost entirely from only one of the two gates.

In the system on the right, the runners are equidistantly split at each junction with respect to the castings, so that the flow of metal is even. Every gating system should be designed to fill all mold cavities at the same time, and at a rate assuring that the level of metal in all cavities is the same. Failure to do this is a commonly encountered error in the gating practice for multiple castings.

As an example, consider Fig. 6, illustrating a right angle type of bracket having one leg of the right angle horizontal and the other vertical. In the layout on the left, the runners to the two bottom cavities

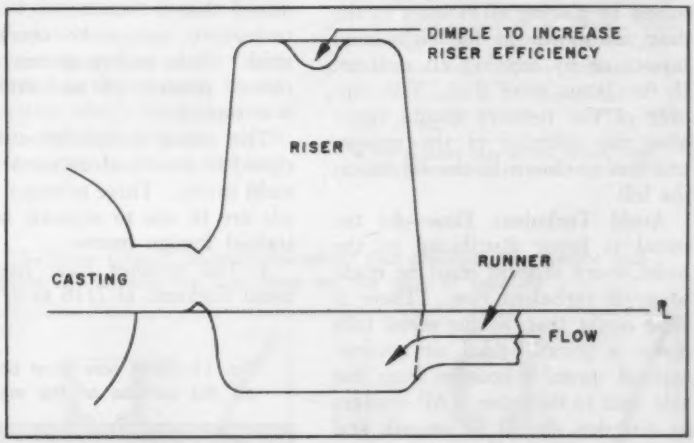
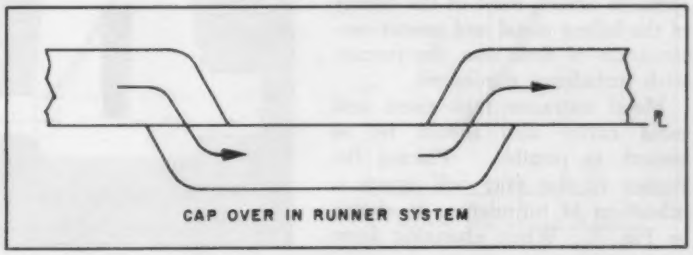


Fig. 7—Placing the runner in the drag cuts down on turbulence. The change from cope to drag must be streamlined

Fig. 8—Abrupt changes in direction and cascading metal are avoided in this streamlined cap-over in runner system



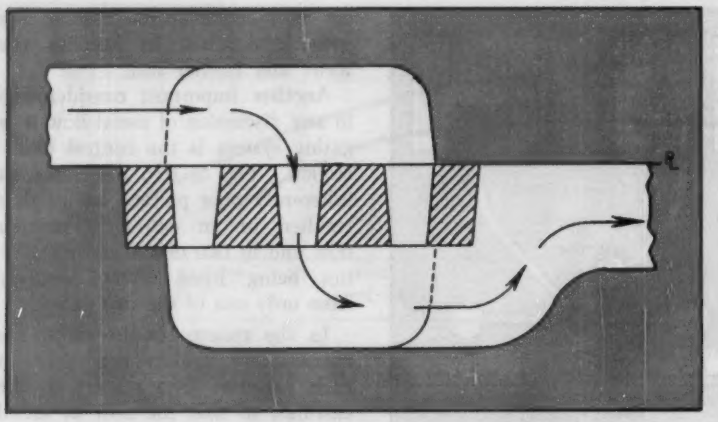


Fig. 9—Flow of metal through a strainer core. The small slag particles are not held back by relatively large holes of such cores

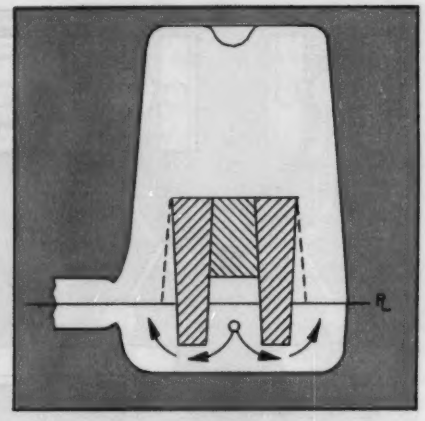


Fig. 10—A double skim core may be employed in some cases

are in the cope. The runners to the remaining cavities are in the drag. The top four cavities are filled to the level of the parting of the mold before the bottom cavities begin to receive any metal. As a result, thin pads and scrap castings were obtained in the right angle castings filled through the cope gate.

This problem could have been solved by placing all runners in the drag, as shown in the right-hand layout, or by capping all runners. If the latter were done, the cap-over of the runners should occur after the splitting of the stream, and not as shown in the layout on the left.

Avoid Turbulent Flow—As the metal is being distributed to the mold, every attempt must be made to avoid turbulent flow. There is little doubt that, as the metal falls down a parallel-sided or reverse-tapered sprue, it bounces from one side wall to the other. All changes in direction should be smooth and gradual. Research conducted at Battelle Memorial Institute for American Foundrymen's Society has shown that a small reservoir (enlargement) should be placed in the gating system at the bottom of the sprue to absorb some of the energy of the falling metal and permit continuation of flow into the runner, with turbulence minimized.

Metal entrance into risers and mold cavity also should be as smooth as possible. Placing the runner in the drag will create a minimum of turbulence, as shown in Fig. 7. When changing from cope runner to drag runner, the process should be as gradual and streamlined as possible, and all abrupt changes in direction and cascading of metal must be avoided, as shown in Fig. 8.

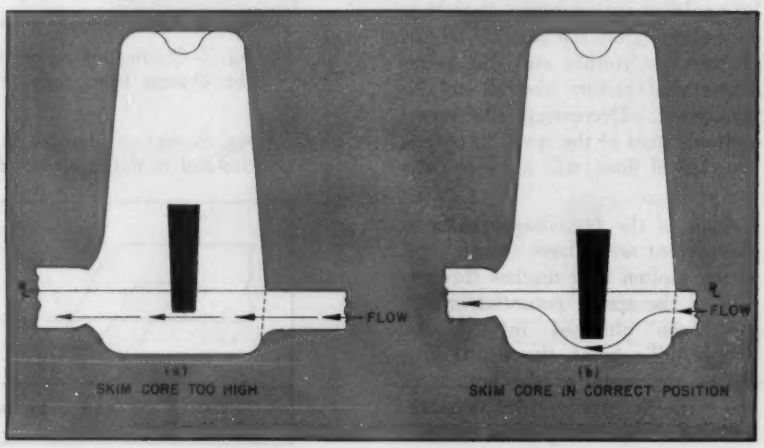
If design permits, it is preferable to let the metal enter the mold from the bottom to prevent cascading over cores and green sand projections. The elimination of any condition that is conducive to metal turbulence cannot be overemphasized. Nicks and roughness on the runner pattern are undesirable, as is mismatch.

The gating system must be designed to provide clean metal in the mold cavity. Three principal methods are in use to separate out entrained foreign matter:

1. The *strainer core,* having a usual thickness of 7/16 to 9/16 in., is round or rectangular in shape and contains a series of holes through which the metal passes. Fig. 9 depicts the flow of metal through a strainer core. Obviously, since the holes are ¼ in. in diam or larger, small particles of very fluid slag will not be held back unless they are near the surface and adhere to the core.

2. The *skim core* in effect skims the metal as it passes by underneath, retaining the slag which has floated to the top. Fig. 11*a* illustrates how a skim core is positioned improperly so that metal and slag are entering the casting cavity before having reached the level of the bottom of the skim core. Fig. 11*b* shows a sketch of a properly positioned skim core in a riser. A double skim core sometimes is employed, Fig. 10.

Fig. 11—Skim core must be properly positioned so that slag is skimmed off the surface of the metal stream before it enters the mold cavity



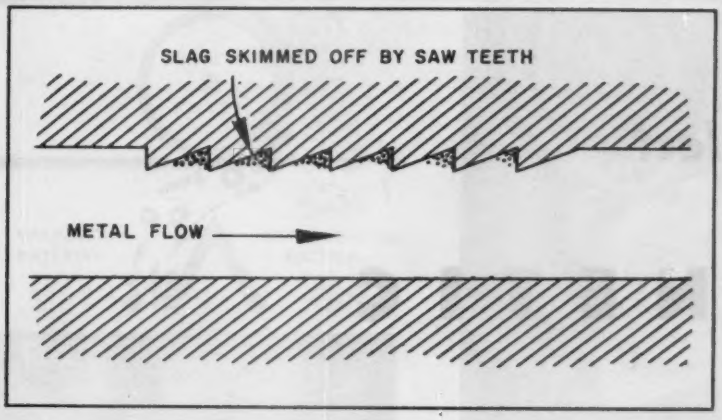


Fig. 12—Saw-tooth runner works only when molten metal has travelled far enough at slow speeds to allow slag to float to the top

3. The *saw-tooth runner,* depicted in Fig. 12, is a recent development for trapping slag. It is successful only when the metal has traveled far enough, at a sufficiently slow rate, to allow the slag to float to the top prior to reaching the saw-toothed portion of the runner.

One company has, by meticulous investigation, determined that slag defects can be eliminated entirely with no skim core in the system, if the metal is permitted to travel a distance of 5 in. at a velocity not exceeding 0.75 ft per second. Similar results can be anticipated at other foundries.

Flow Pattern Is Universal—The type of flow obtained in any gating system and the flow pattern developed in the mold cavity do not depend on the type of metal poured. In other words, the same type of flow is obtained from a given system regardless of whether aluminum, malleable iron, or steel is poured, since the hydraulic principles involved determine the conditions of flow and are equally applicable to all liquids. However, to provide the hottest metal to the feeder in malleable iron it is usually advisable, because of the high shrinkage of white iron as compared with gray iron, to gate into the feeder and from the feeder into the casting.

While the use of a tapered sprue (small end down) offers many advantages, some mechanized foundries prefer to employ a parallel-sided sprue to facilitate molding. Many of the desirable features of a tapered sprue can be obtained by using a parallel-sided sprue and introducing a choke into the runner near the sprue base. Turbulence can be avoided by using a radius between pouring basin and sprue entrance as well as streamlined bends in runners and between runners and gates.

When gating systems that do not use chokes either in the bottom of the sprue or in the runner are used, higher frictional losses are incurred in the system, and more turbulent losses are encountered due to higher metal velocities.

The pouring cup or sprue basin is important as the element in the gating system which determines the maximum volume rate at which liquid metal may be introduced into the casting. According to Pellini et al.,[4] a flat-bottom pouring cup is essential to provide the pressure condition for optimum performance; cone-shaped cups create a vortex which hinders metal flow.

How changes in the pouring cup height and diameter affect flow rate is shown in Fig. 13.[4] If the height of metal in the pouring cup is increased, both flow velocity and volume rate of flow are increased. Increasing the height of the pouring cup by 2 inches increases the flow rate by about 4 lb per second.

Note that a ¼-in. increase in the diameter of the cup opening (in the range of ¾ to 1½ inch) also produces an increase in flow rate of approximately 4 lb per second. The maximum amount of metal which may be delivered from cup to sprue is determined by the height of metal in the sprue cup.

The writer gratefully acknowledges the invaluable assistance so graciously rendered by C. Russell Baker, chief engineer of Albion Malleable Iron Co., in the preparation of this manuscript.

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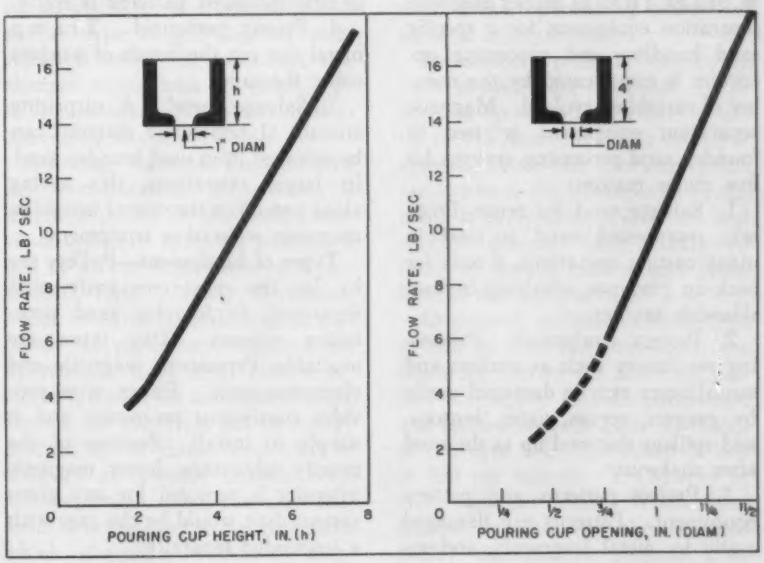
Fig. 13—These graphs illustrate the effect that changing the height and diameter of the pouring cup have on the rate of pouring



How To Select

MAGNETIC SEPARATION EQUIPMENT

Magnetic separation equipment, when chosen by methods described in this article, can benefit a ferrous foundry by salvaging sand and tramp metal, plus protecting equipment and personnel

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● SELECTION of proper magnetic separation equipment for a specific sand handling and processing operation is complicated by the number of variables involved. Magnetic separation equipment is used in foundry sand processing systems for five major reasons:

1. Salvage sand for reuse. Properly reprocessed sand is used in many casting operations, if only for back-up purposes, resulting in considerable savings.

2. Protect equipment. Processing machinery such as mullers and sandslingers can be damaged easily by gaggers, sprues, gates, buttons, and spillage that end up in the sand after shakeout.

3. Protect patterns and pattern equipment. Patterns are damaged easily by metal fragments, and repairing damaged patterns is costly.

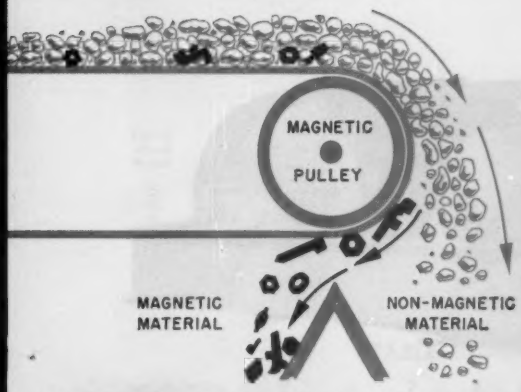
4. Protect personnel. Tramp metal can cut the hands of workers using the sand.

5. Salvage metal. A surprising amount of remeltable material can be salvaged from used foundry sand. In larger operations, this saving alone can offset the cost of installing magnetic separation equipment.

Types of Equipment—Pulleys are by far the most commonly used separators in foundry sand processing systems. Two types are available: Permanent magnetic and electromagnetic. Either type provides continuous protection and is simple to install. Because of the gravity advantage, lower magnetic intensity is required for any given system than would be the case with a suspended separator.

Also, separation action of a pulley reduces the possibility of belt damage that could occur from jagged fragments being lifted from the conveyor by a suspended unit. Fig. 1 shows a typical pulley installation and a schematic drawing of the principle of operation.

Another type of separator is the suspended electromagnet available in either rectangular or circular styles. Because of the quantity of material that must be removed in most foundry applications, however, magnets of this type are rarely used except where space restrictions make it impossible to utilize automatic suspended equipment. These magnets can be suspended at any convenient point over a belt conveyor or angled over the head pulley, Fig. 2. They can also be



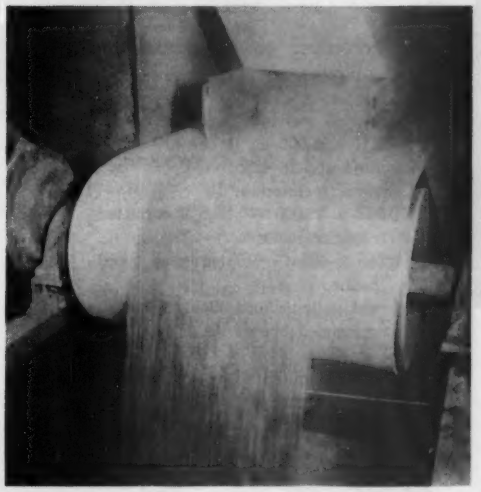


Fig. 1—This pulley is a ceramic permanent magnet. Operating principle of the system is demonstrated by the drawing above the photo

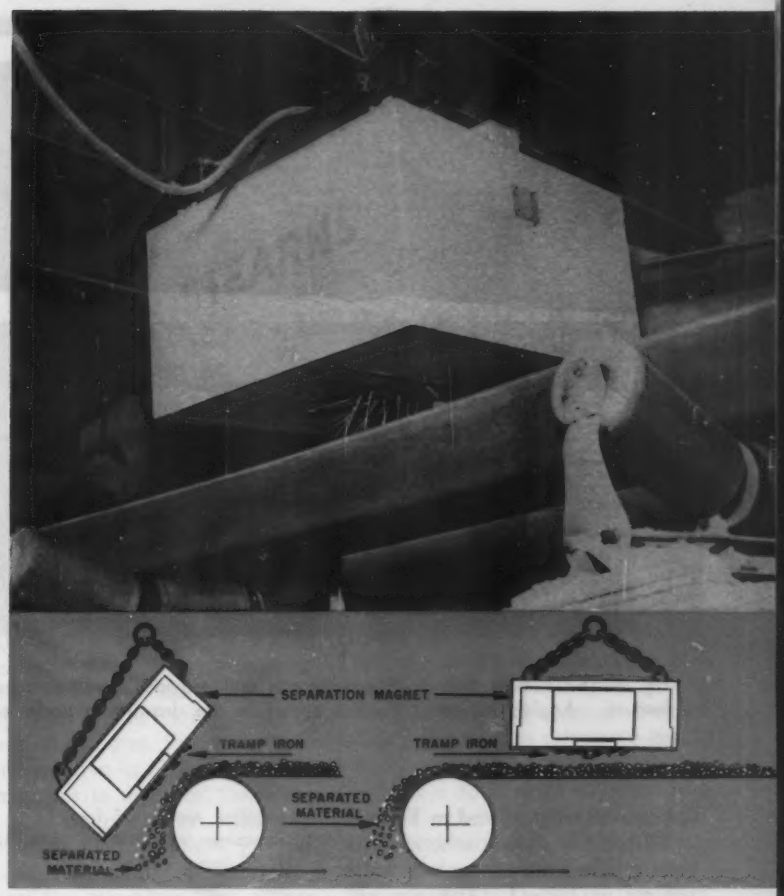


Fig. 2—Photo shows a suspended magnet removing core nails from foundry sand on a conveyor belt. Two basic methods for mounting suspended units such as this are shown in the drawing

suspended over vibrating, apron, or pan conveyors.

An adaptation of the suspended magnet is the automatic self-cleaning suspended unit illustrated in Fig. 3. It performs in much the same way as standard suspended magnets but provides the convenience of continuous discharge of tramp metal. In the event of power failure, these units with self-cleaning action will not drop an accumulation of material onto the belt, as is the case with conventional suspended units.

The particular unit shown is called a para-belt. Separators of this type, when used with a belt conveyor, are installed preferably at a slight angle over the head pulley. As shown in the drawing, the cleated, moving belt provides continual discharge of tramp metal. A similar type of self-cleaning unit, which is called the cross-belt, discharges tramp iron to either side of the conveyor, but is not used as commonly as the para-belt.

Selecting Magnetic Pulleys—The first consideration in selecting a magnetic pulley for use with a conveyor system is to decide whether it will be an electromagnetic or a permanent type. Newly developed, highly oriented ceramic magnet materials for permanent magnets are lightweight, have high electric resistivity, and resist demagnetization. One of our materials has an energy product up to three times that of ordinary un-oriented ceramic magnet materials. Also, the new material is not subject to the flux shifts which take place in ordinary magnets, thereby permitting pulley designs of high efficiency.

Permanent pulleys employing such material are available in diameters up to 48 in. for belt speeds up to 435 fpm. In larger conveyor systems, where belt sizes and speeds are extreme, electromagnetic equipment is preferable. New coil and control designs have eliminated many of the old maintenance problems of this equipment.

In general, within the limitations of size as discussed previously, the following factors for selecting pulleys will apply to both permanent and electromagnetic units: 1. Width of conveyor belt. 2. Speed of belt in feet per minute. 3. Capacity in cubic feet per hour. When these factors are known, the required pulley size can be selected from

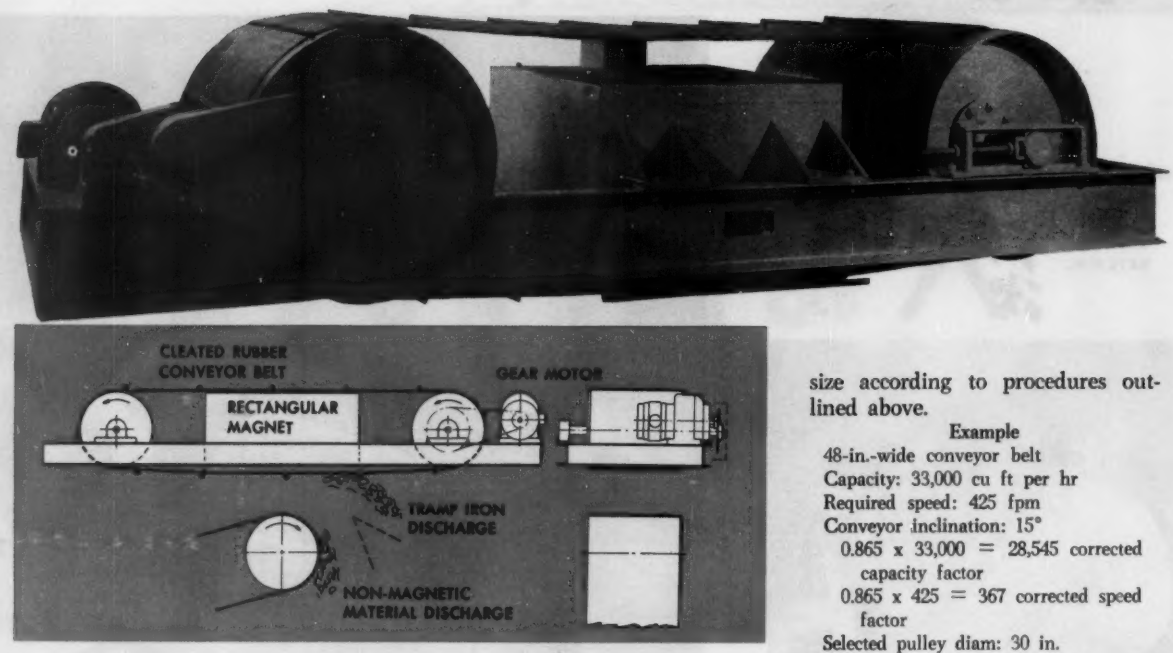


Fig. 3—The cleated belt on this automatic unit provides a self-cleaning feature. Angled mounting position shown in the drawing is preferred

the data which are listed in Table 1.

To begin a sample selection procedure, select the proper belt width column in Table I. This also will be the pulley width. In the width column, locate the capacity equal to or next larger than that required. For best separation, belt speed should not exceed recommended speed indicated in last column for the size pulley selected.

Example

48-in.-wide conveyor belt
Capacity: 33,000 cu ft per hr
Pulley: 36-in. diam x 48-in. wide
Belt speed: 365 fpm

If faster belt speeds are needed, determine difference in feet per minute between required speed and recommended speed for the size selected. Add one-half of this difference to the recommended speed to obtain corrected speed factor. Diameter of pulley will correspond to that factor.

Example

48-in.-wide conveyor belt
Capacity: 33,000 cu ft per hr
Required speed: 425 fpm
Recommended speed for 36-in. diam: 365 fpm
425 − 365 = 60
365 + 60/2 = 395 corrected speed
A 42-in.-diam pulley should be used

Belt conveyors inclined upward on the approach to the magnetic head pulley can be operated at faster belt speeds and increased capacities. Table II gives correction factors to be used in selecting correct pulley size.

Multiply capacity in cubic feet per hour by correction factor for degrees of inclination to obtain corrected capacity factor. Multiply required belt speed by correction factor for degrees of inclination to obtain corrected speed factor. Using corrected factors for capacity and speed, select required pulley size according to procedures outlined above.

Example

48-in.-wide conveyor belt
Capacity: 33,000 cu ft per hr
Required speed: 425 fpm
Conveyor inclination: 15°
0.865 x 33,000 = 28,545 corrected capacity factor
0.865 x 425 = 367 corrected speed factor
Selected pulley diam: 30 in.
Recommended speed: 330 fpm
(367 − 330) ÷ 2 + 330 = 349
A 36-in.-diam x 48-in.-wide pulley should be used

Selecting Suspended Magnets— The data that follow apply to all types of suspended units—rectangular, para-belt, and cross-belt. As mentioned previously, the para-belt style usually is preferred. Experience has shown that mounting the unit tilted over the head pulley is most effective. A lower cost magnet with less magnetic strength is required for any given suspension height than would be needed if the unit were installed parallel over the conveyor belt.

Because magnetic flux density at most normal suspension heights tapers off across the width of the magnet, a magnet wider than the actual burden should be selected to assure uniform magnetic strength across the entire burden width.

The required height of suspension is established either by the maximum object size or the average

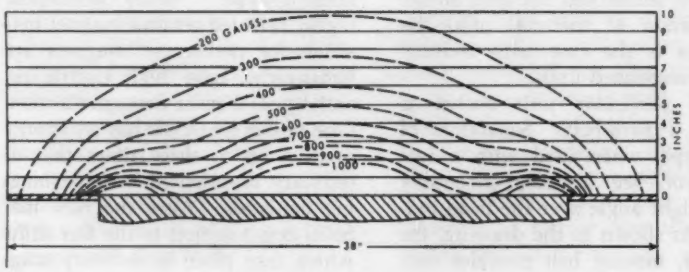


Fig. 4—Typical gauss pattern shows flux density tapering off across the width of a permanent magnet pulley

TABLE I—Magnetic Pulley Capacities, Cubic Feet per Minute

Pulley Diam, Inches	Width of Belt												Normal Belt Speed, fpm
	12 in. cu ft	14 in. cu ft	16 in. cu ft	18 in. cu ft	20 in. cu ft	24 in. cu ft	30 in. cu ft	36 in. cu ft	42 in. cu ft	48 in. cu ft	54 in. cu ft	60 in. cu ft	
12	790	1080	1460	1880	2330	3500	....	.....	.....	.....	.....	.....	175
15	900	1240	1670	2150	2660	4000	6300	.....	.....	.....	.....	.....	200
18	1010	1390	1880	2420	3000	4500	7100	10500	.....	.....	.....	.....	225
20	....	1550	2090	2690	3330	5000	7900	11700	16600	.....	.....	.....	250
24	....	....	2380	3060	3800	5700	9000	13300	19000	26200	.....	.....	285
30	....	....	....	3540	4400	6600	10400	15400	22000	30400	.....	.....	330
36	....	....	....	....	4860	7300	11500	17000	24300	33600	43300	.....	365
42	....	....	....	....	....	8000	12600	18700	26700	36800	47500	59000	400
48	....	....	....	....	....	8700	13600	20300	29000	40000	51600	64200	435
54	....	....	....	....	....	....	.....	22200	31700	43700	56400	70100	475
60	....	....	....	....	....	....	.....	.....	33300	46000	59300	73800	500

TABLE II—Conversion Factors for Inclined Conveyor Belts

Degrees Incline	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Correction Factor	0.955	0.946	0.937	0.928	0.919	0.910	0.901	0.892	0.883	0.874	0.865	0.856	0.847	0.838	0.829	0.820

depth of material carried upon the conveyor, whichever is larger, plus approximately 3 to 4 in. Obviously, materials carried upon 20-degree troughed conveyor belts have the deepest burden in the center of the belt, and the burden width is somewhat less than the conveyor belt width. For purposes of material depth calculation, assume effective material width to be approximately 5/6 of the belt width.

The following formula can be used to determine nominal burden depth in inches in the center of a troughed conveyor belt. This formula takes into account effective burden width:

$$De = 25.2\,C \div WV$$

Where: De = center burden depth in inches on a 20-degree troughed conveyor, C = capacity in cubic feet per minute, W = width of belt in feet, and V = belt speed in feet per minute.

As an example, consider a 36-in. belt conveyor traveling at 400 fpm carrying 300 cfm. The formula gives a nominal burden depth of 6.3 in.:

$$De = 25.2 \times 300 \div 3 \times 400 = 6.3 \text{ in.}$$

Assuming that the average material depth in this example is larger than the maximum object size, the depth determines magnet suspension height. After adding 3 to 4 in. for material clearance, total suspension height will be about 10 in. above the belt surface. This application would require a 36-in.-wide magnet and the conditions under which it must perform determine magnetic strength required.

Removal of smaller tramp iron objects requires a stronger magnet than removal of larger objects. Conveyor speed is important if the magnet is to be mounted parallel over the conveyor. Speed is of less importance if a tilted magnet is used since momentum of the material to be extracted flows in the general direction of extraction.

Deeper material requires greater strength to extract any tramp iron object and this effect is considerably greater with the magnet mounted parallel over the conveyor. The material on the belt has a tendency to fall away and open up as it cascades over the pulley, presenting greater voids through which the tramp iron can be extracted by a magnet tilted over the pulley.

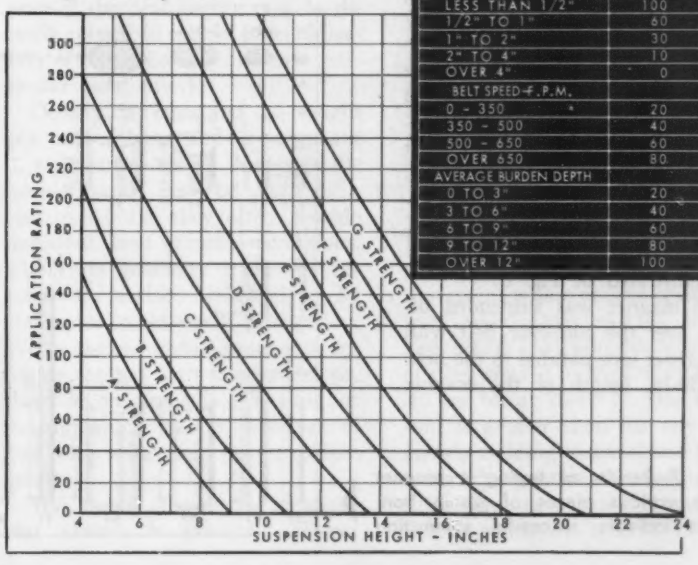
Ratings given in Fig. 5 are evaluation guides to assist in the selection of a magnet which will have suitable magnetic strength for the required separation job. Add the ratings for minimum size tramp iron, conveyor speed, and average burden depth and select the line on the chart which corresponds to the total rating. The intersection of application rating and suspension height lines should fall between two diagonal lines indicating the relative strength of magnet required for the necessary separation.

For example, if a magnet tilted over the head pulley of a belt conveyor must remove tramp iron of less than ½ in. in size, the over-all rating is 110. That is based on the ratings of 80 for minimum size tramp iron, 0 for belt speed of 400 fpm, and 30 for average burden depth of 6.3 in. as calculated previously.

Since a 36-in.-wide conveyor belt is used and suspension height is 10 in., the intersection of the 110 application rating line and the 10-in. suspension height line on the chart in Fig. 5 indicates that a D strength magnet is required for this job. Automatic, suspended, self-cleaning type separators, such as the cross-belt and para-belt units, may be se-

Fig. 5—Typical magnet selection chart. Four factors determine strength required for a given magnet size, position

INSTALLATION FACTORS	SUSPENSION POSITION	
	PARALLEL OVER BELT	TILTED OVER PULLEY
MINIMUM SIZE TRAMP IRON		
LESS THAN 1/2"	100	80
1/2" TO 1"	60	50
1" TO 2"	30	20
2" TO 4"	10	5
OVER 4"	0	0
BELT SPEED-F.P.M.		
0 - 350	20	0
350 - 500	40	0
500 - 650	60	10
OVER 650	80	20
AVERAGE BURDEN DEPTH		
0 TO 3"	20	0
3 TO 6"	40	10
6 TO 9"	60	30
9 TO 12"	80	60
OVER 12"	100	80



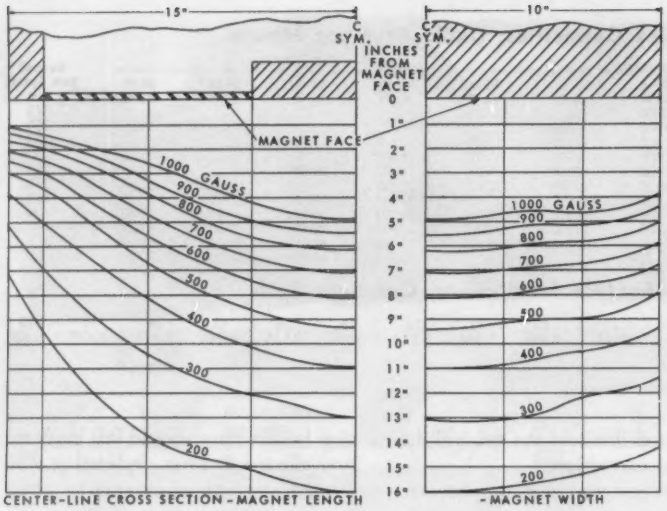


Fig. 6—Typical gauss chart for a rectangular suspended magnet. Readings represent normal continuous operation

lected in accordance with the same procedure.

Power Consumption—Power consumption of electromagnetic, suspended separators varies according to the strength required for any given width. For example, a 24-in.-wide rectangular magnet of A strength as shown in Fig. 5, draws approximately 2,050 w. Bigger units require proportionately more power. Also, power consumption of ½ to 7½ hp motors used to drive the automatic self-cleaning suspended units, such as the cross-belt and para-belt types, must be considered in computing total power consumption.

Electromagnetic pulleys range from 12 to 60-in. in diam and require proportionately increasing power ranging from 350 to 8300 w.

Research Testing—The following is a description of a test recently made in the Stearns laboratory. The separator used was a 20-in.-wide x 30-in.-long x 24-in.-high standard Stearns rectangular suspended magnet with a coil rating of 1380 w. It was operated at 80 per cent of normal cold current to simulate expected results under continuous operation and produced the gauss pattern illustrated in Fig. 6.

The magnet was suspended directly over the conveyor belt with the magnet face parallel to the belt. The 30-in. length of the magnet was oriented in the direction of belt movement.

The magnet was suspended at heights of 12, 10, 9, and 8 in. above the belt. At each of these heights, tests were run at belt speeds of 270 and 335 fpm. The tests were conducted with no material burden on the belt or on the tramp iron. Each piece of tramp iron was placed separately on the belt at the respective suspension height and belt speed.

Fig. 7 illustrates the physical dimensions of the tramp iron objects —hot-rolled steel—used for these tests. The objects with length greater than diameter were tested on the conveyor belt with their length parallel to the direction of belt movement and with the length of the object positioned at an oblique angle to the direction of belt movement.

Fig. 7 shows that the magnet at a 12-in. suspension produced 340 gausses at the belt under continuous operating conditions. At this gauss intensity only a relatively few objects were picked up. At the 10-in. suspension or 460 gauss figure, the number of objects attracted by the magnet was greater.

At the 9-in. suspension producing 530 gausses, all of the objects were attracted by the magnet with the exception of the small flat piece A1 and objects B1 through B4 which have equal dimensions.

Additional tests with larger magnets producing deeper magnetic fields and using the same tramp iron objects show that if the suspension produces a gauss density at the belt equal to the smaller test magnet, the results of separation are similar.

Test results show that the physical shape of tramp iron expected to be encountered and separated has a bearing on the size magnet and suspension height required. The test also shows that any magnet producing under 600 gauss at the belt under continuous operating conditions could allow a piece of tramp iron to escape.

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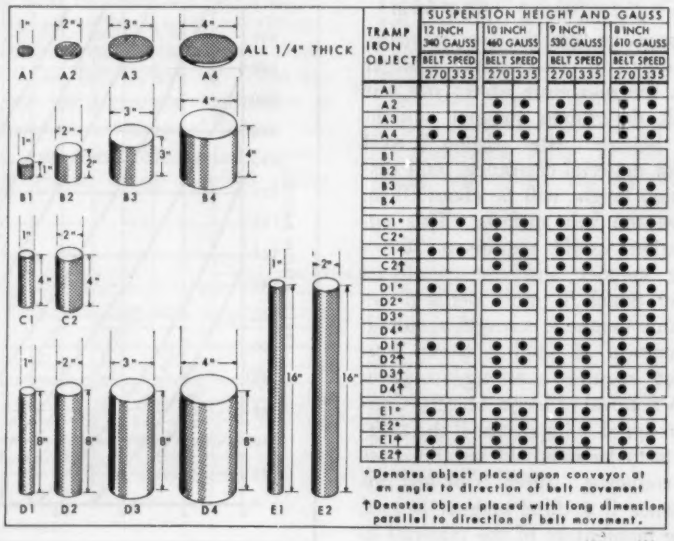


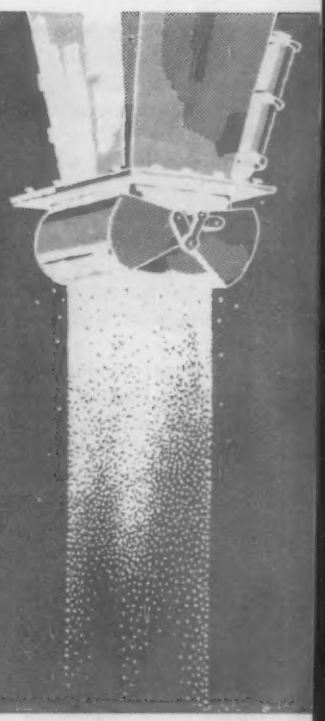
TRAMP IRON OBJECT	SUSPENSION HEIGHT AND GAUSS							
	12 INCH 340 GAUSS		10 INCH 460 GAUSS		9 INCH 530 GAUSS		8 INCH 610 GAUSS	
	BELT SPEED		BELT SPEED		BELT SPEED		BELT SPEED	
	270	335	270	335	270	335	270	335
A1							●	●
A2			●	●	●	●	●	●
A3	●	●	●	●	●	●	●	●
A4	●	●	●	●	●	●	●	●
B1								
B2							●	
B3							●	●
B4							●	●
C1*	●	●	●	●	●	●	●	●
C2*			●		●	●	●	●
C1†	●	●	●	●	●	●	●	●
C2†			●	●	●	●	●	●
D1*	●	●	●	●	●	●	●	●
D2*			●	●	●	●	●	●
D3*					●	●	●	●
D4*					●	●	●	●
D1†	●	●	●	●	●	●	●	●
D2†			●	●	●	●	●	●
D3†			●		●	●	●	●
D4†			●		●	●	●	●
E1*	●	●	●	●	●	●	●	●
E2*			●	●	●	●	●	●
E1†	●	●	●	●	●	●	●	●
E2†	●	●	●	●	●	●	●	●

*Denotes object placed upon conveyor at an angle to direction of belt movement

†Denotes object placed with long dimension parallel to direction of belt movement.

Fig. 7—Results of testing a magnet with various pieces of tramp iron. Dots indicate successful separation

Characteristics of FOUNDRY SANDS



● ● ● *Sand types are discussed in this second article in a series of six on sand topics. Availability, cost, stability, density, and melting point are some of the items covered*

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● THE WORD "SAND" has come to mean silica sand to most people. But it should be remembered that sand can also be "the more or less fine debris" of several other minerals. Although silica sand serves its purpose well in the foundry, similar properties can be provided to a greater or lesser extent by other materials in sand form.

All materials to be discussed here can be mixed with appropriate binders and used as green or dry molding and core sands. These mixtures provide the necessary properties of permeability and green or dry strength. The major differences to be discussed include expansion, refractoriness, thermal properties, density, grain geometry, chemical inertness, and cost.

Sand Performance—In both sand molds and cores, molten metal at elevated temperatures comes into intimate contact with a portion of the mass. The molten metal immediately starts to give up some of its heat to the surrounding medium and thus the mold wall is heated. This rise in temperature may cause the sand to expand and, in expanding, buckle or shift, thus creating serious surface defects.

The rise in temperature also may be severe enough to cause a physical breakdown of individual grains if the refractory quality is too low. This breakdown also contributes to mold wall failures. Another important consideration is the degree to which the heat will be transferred. Some materials possess higher thermal conductivity than others. In some cases the lower levels are desirable and in other instances a higher level is needed. Conductance of the heat energy may be directly related to control of solidification of the mass of metal in a particular mold cavity.

Density is measured as weight per unit volume and is important in at least two ways. Although the heavier sands may be more difficult to handle, they often provide improved heat transfer conditions. The grain geometry is directly related to surface smoothness by reason of mold wall penetration. When molten metal comes into intimate contact with some materials, there is an immediate wetting or fluxing which creates problems of flow with subsequent poorer surface quality.

And, finally, the matter of initial cost always is present. Higher initial cost can be justified only if most of the other characteristics are improved or if the casting in question is a special problem.

This discussion, then, will be centered around general comparisons with respect to the above-mentioned characteristics. In most instances the comparison will be with silica sand since it is the most common sand and the one best understood by most foundrymen.

Silica Sand — Due to its abundance, which helps reduce initial cost, silica sand is used more extensively than any other sand substance. It is silicon dioxide, SiO_2, in the alpha quartz stage and goes through a transformation to beta quartz when heated as in a mold. The beta quartz reverts to the alpha stage upon cooling. The major effect during this cycle is one of expansion and subsequent mold wall movement which creates casting defects called scabs, rattails, buckles, and others. Measurable expansion of silica sand is in the order of 0.018 in. per in. at 2000° F. This expansion is greater than for any other known molding material and is definitely the greatest disadvantage of silica sand as a molding material.

The refractory quality of silica

sand generally is considered to be good. The melting point is approximately 3250° F, which is above the temperature of most molten alloys. The melting point alone has limited value as a refractory measure, however, since before melting, other important changes may take place. The true refractory measures support the performance of silica sand, and for simplicity the melting point is cited as a comparison.

Thermal conductivity of silica is neither a distinct advantage nor a major disadvantage. Its performance in this respect is satisfactory and thermal stability is high. Other important sand substances exhibit higher thermal conductivity and still others possess a lower conductivity value. The density, measured in pounds per cubic foot, should be noted since it will be used for comparisons. This value is approximately 100 pounds per cubic foot depending on several variables.

Nature provides silica sand grains in several shapes and in numerous sizes. There is no real casting problem since any combination of shapes and sizes can be found in the several natural deposits. Foundrymen and researchers constantly are seeking additional information on how these factors affect castings. Carelessness can promote a health hazard, however, due to the presence of very small particles of silica.

Silica sand is wetted easily by molten metals, and fluxes with iron at approximately 2240° F. This action can be reduced by using mold washes and facings. In spite of this, however, castings made in silica sand molds often exhibit less than good surface conditions, and cleaning costs may rise.

Zircon Sand—Zircon sand, chemically known as zirconium silicate or $ZrSiO_4$, first came to the attention of foundrymen about twenty years ago. Experiments showed that it had rather remarkable properties. It is found in several geographic areas, including Australia, Florida, and California. Zircon owes its desirability as a molding or mold facing material to such properties as low expansion, high refractoriness, high thermal conductivity, and resistance to wetting.

Expansion of zircon sand is approximately one-sixth that of silica. This expansion, perhaps the least of any known sand substance, contributes importantly to its desirability. The low expansion and its high refractory value permit use of finer grains, thereby producing smoother surfaces free of expansion defects. The melting point of zircon is approximately 4800° F, and stability at elevated temperatures is rated as excellent. Its thermal conductivity also is very high, being rated at about twice that of silica.

Another distinct advantage to zircon sand is its chemical inertness. Since it is not easily wetted by molten metal, burn-on and penetration are greatly reduced and casting cleaning costs are lowered.

The foundryman who notes with surprise these properties must be cautioned regarding the cost of zircon sand. The density also is nearly twice that of silica, making it much heavier to handle. The cost may run as much as seven or eight times that of silica depending on common variables. Consequently, it is not particularly advisable to use zircon as freely as silica. When used as a facing, however, its useful properties can be utilized and savings in cleaning costs alone will return the investment. The effect of zircon on heat transfer may be calculated and the foundryman can promote and control directional solidification.

It is necessary to make important changes in foundry practice where zircon sand is being applied. Bonding additions must be kept to a minimum, mixing time increased to achieve necessary high strength, and aeration is very important. To control the use of zircon by the careless worker, it is recommended that different mixes be dyed distinctive colors for identification.

Olivine Sand — The Norwegian foundry industry has relied on olivine sand for some time, and during more recent years it has come to be known and produced in the United States. It is chemically an ortho-silicate of magnesium and iron, occurring in nature as forsterite and fayalite. The ratio of these major constituents is not fixed and only those deposits producing material with 90 per cent forsterite minimum are considered useful as a foundry aggregate.

The material is found as larger masses and must be processed by crushing to produce a sand aggregate. This processing may provide for a more specific sizing of grains and also promotes the possibility of angular grains. The tendency toward more angular grains may lead to the necessity for more careful processing into synthetic sand mixtures. Good control of molding sand properties can be maintained.

Olivine exhibits somewhat lower thermal expansion characteristics than silica sands. Stability is excellent. The melting point of a high-quality olivine sand is approximately 3400° F, slightly higher than for silica. Although thermal

Properties of Various Types of Sands

	SILICA (Silicon dioxide)	OLIVINE (Orthosilicate of iron & magnesium)	ZIRCON (Zirconium silicate)	CARBON (Particles of hard carbon)	CHAMOTTE (Calcined clay)	MULLITE (Aluminum silicate)
	SiO_2	$2(MgFe)O.SiO_2$	$ZrSiO_4$	C		$Al_2O_3.SiO_2$
Availability	Very Abundant	Limited (Processed)	Limited	Good (Manufactured)	Limited (Manufactured)	Fair (Processed)
Cost	Low	Medium	High	Medium	Medium	Very high
Stability	Good	Good	Excellent	Good	Fair	Good
Expansion (in. per in.)	High (0.019)	Medium (0.0137)	Low (0.0032)	Very low	Low (0.0052)	Low (0.0086)
Contraction	High	Low	Medium	....	....	....
Conductivity	Low	Low	High	High	Low	Low
Melting point (approx.)	3250° F	3400° F	4800° F	5800° F (sublimes)	Variable	3290° F
Approx. density (lb/cu ft)	96 to 100	122	175	55	Under 100	91
Wetted by molten metal	Easily	Easily	Not easily	Not easily	No problem	No problem

conductivity of olivine is quite good, its real value comes from a thermal behavior unlike that of silica. This is shown by the fact that olivine exhibits low expansion and low contraction while silica exhibits slightly higher expansion and high contraction.

Density of olivine sand is higher than that of silica but not so high as zircon. The angular grain shape provides for a better control of rammed density. Olivine sand is wetted by molten metals to about the same extent as silica sands, but this property is greatly offset by its improved thermal characteristics. Olivine costs more than silica because it is less abundant and requires processing. It is, however, not as costly as zircon and, being free of silica fines, is not a potential health hazard.

Carbon Sand—Some early experimental work was done with a high-grade foundry coke ground and screened to produce a carbon sand. This sand showed some real advantages but the sulfur content, even when kept low, produced an offensive and toxic gas during pouring of the molds.

More recent work utilizes screened particles of hard carbon as sand either for the entire mold or core or as a supplementary material in facing. It possesses good physical properties in its own right and resists breakdown due to thermal factors. Both expansion and contraction are low.

Carbon sand possesses good thermal conductivity and is not easily wetted by molten metals. In addition, carbon sand has a lower rammed density than any of the other sand substances, being about one-half that of silica and nearly one-fourth that of zircon. It must not be considered a cure-all, although carbon sand is a newer, very useful tool for the foundryman.

Chamotte Sand—Selected clays, calcined by firing at high temperatures, may be used as the sand substance in molding applications. The clay fuses into lumps which are then ground to sand particle sizes. This process, more popular in European foundries than in the United States, provides foundrymen with a sand somewhat lower in grain hardness than silica sand. Refractory bricks also may be used as chamotte sand when they are crushed and screened. The bonding clay used with such manufactured sands must be selected with care to prevent mutual fluxing. The quality of clay used and proper firing are the major factors that affect the important characteristics.

Some advantages are claimed for this material but it must be recognized that, like most sands, it has its limitations. Expansion is almost as low as with zircon and carbon sands. Thermal conductivity is rather low, thereby behaving more like carbon sand than zircon sand. Density values for chamotte sand run slightly less than those for silica. In foundries where chamotte sands are used the practice is to employ a coarser grain and thus permeabilities are much higher than with comparable silica sands.

Whitehead Bros. Co. photo

Low cost of silica sand is its chief advantage. Abundant deposits, at or near the surface as shown here, contribute to this factor

Although the cost may be quite high, the use of chamotte sand can be justified in applications where complicated contour control along with good surface conditions are needed. There is no problem with fines when this type sand is used.

Mullite Sand—This term is used to designate materials that are essentially aluminum silicate. They are excellent refractory materials and exhibit low expansion characteristics. A low heat-transfer factor is exhibited and rammed density is just about the same as for silica sand. The cost of mullite as a molding sand aggregate is very high and, hence, not generally popular. Comparable thermal characteristics can be found in much less expensive sands.

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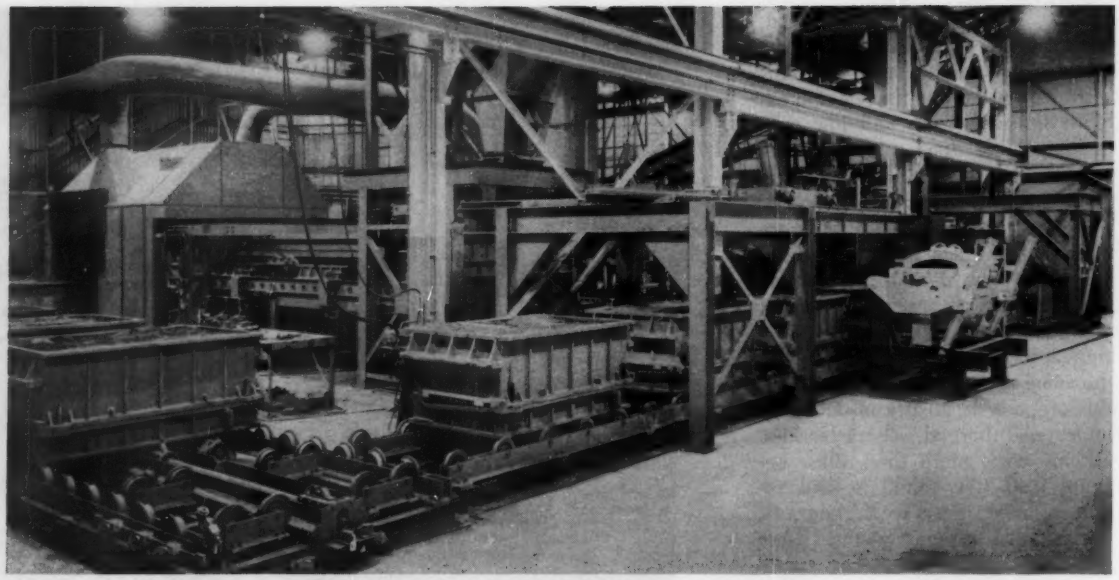


Over-all view of automatic bathtub mold handling system. In foreground, left to right, are cooling line, automatic pouring, closing, and drag machine transfer stations

Molds Handled Automatically

In Casting of Bathtubs

High production has resulted from installation of automatic mold handling equipment in this foundry. Features of the system include shuttle indexing of molds and automatic sand metering

● MOLDS for bathtub castings can be turned out at the rate of 72 an hour on the automatic mold handling system of the Universal-Rundle Corp. foundry at Camden, N. J. Only seven men are needed to operate the system at this rate to produce molds weighing up to 14,000 lb each, including flasks, sand, and casting.

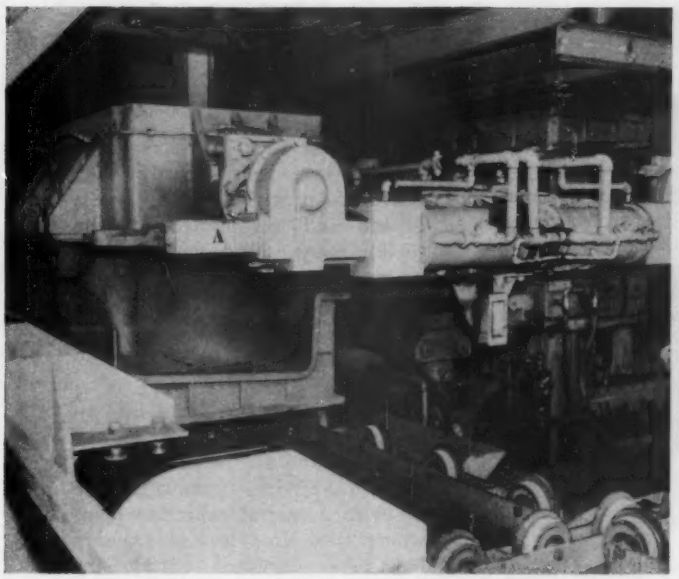
The system was engineered and installed by the Planet Corp., Lansing, Mich. Among its features are complete shuttle indexing, automatic sand metering, use of weights instead of clamps to keep flasks closed during pouring, and indexing of the flasks through the shakeout operation. Only three manual operations are necessary with the system.

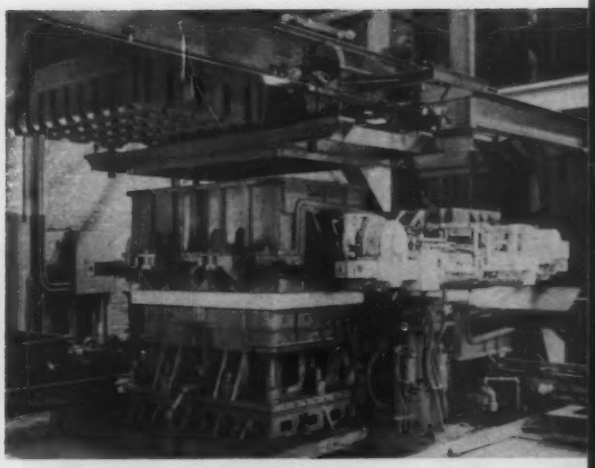
Mold Handling—Molds are handled by a shuttle-type indexing system which operates on a 45-second cycle. Conveyors are of the flanged-wheel type arranged in a rectangle encompassing the molding equipment. Each flask is pushed or pulled individually on the conveyors by combination shuttle and lock-bar hydraulically powered mechanisms.

Basically, the mechanisms are long-stroke cylinders with rotating arms equipped with a varying number of dogs which enable one hydraulic cylinder to index several flasks at the same time. The 44 x 73 x 33-in. steel flasks are held in register by the dogs. The mechanisms, which are synchronized, are actuated by electric limit switches. Flask indexing requires seven seconds. Flasks are in continuous use as they are indexed around the system, so there is no storage problem.

The molding cycle starts at a Herman Pneumatic Machine Co. drag molding machine. It is an index type unit with a transfer and rollover device. The turret clamps onto an empty drag flask which has been raised approximately 3 ft above the conveyor level. The machine is raised a few inches, turns 180 degrees in a horizontal arc, and simultaneously rolls the flask over and places it, bottom up, on the jolting table. The drag flask then is in position for filling.

Sand mixes are prepared in 5000-lb batches in four automatically cycled mullers equipped with moisture determination and addition devices. The batch hoppers measure sand from 100-ton bins over each muller. When mixing is complete,

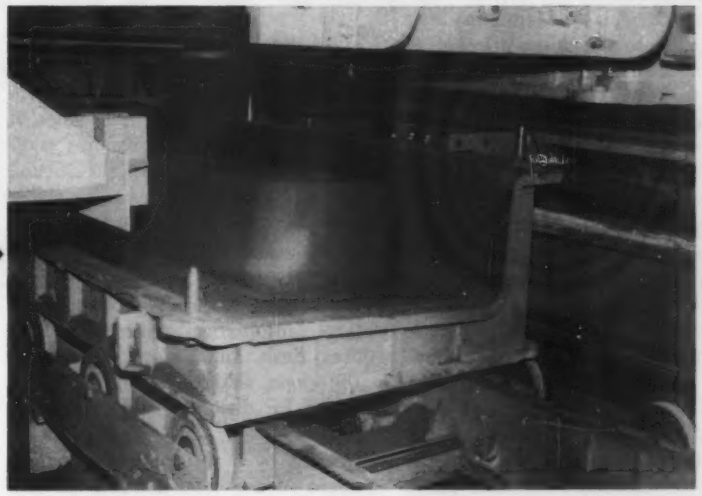




Automatic sand metering box and back-up weights above drag flask in position on jolting table

The mold making cycle begins at the index-type drag molding machine and turret. Drag flask in foreground is in position for pickup by turret

Drag flask is indexed onto the closing station's hydraulic lift

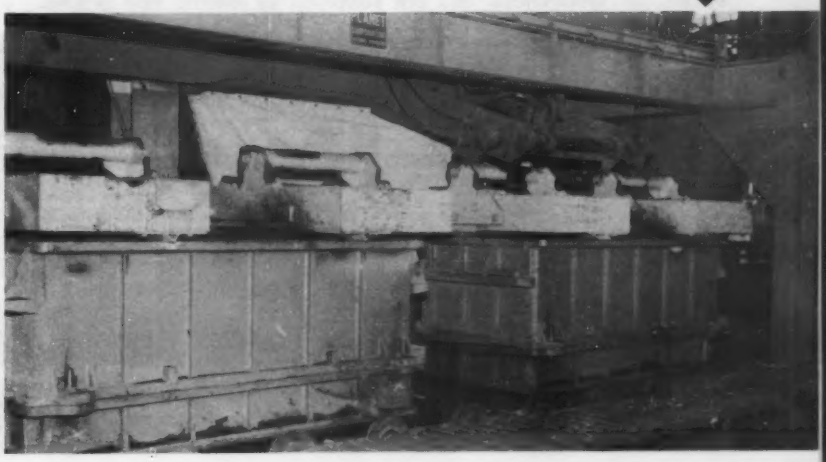


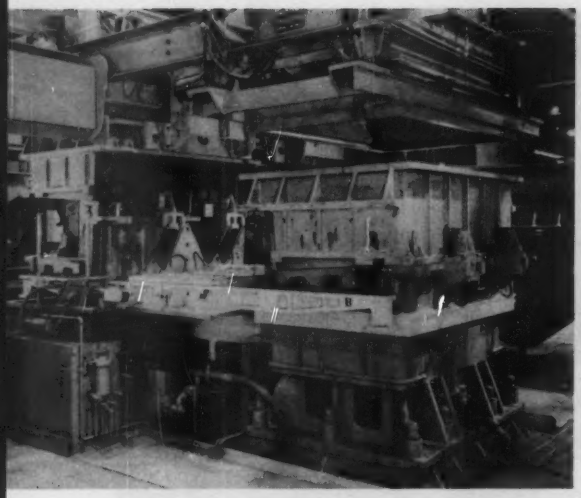
the mullers empty into a troughed belt conveyor in the basement which elevates the sand to the hoppers above the cope and drag molding machines.

Each hopper supplies sand to an automatic metering box designed by Planet which insures a minimum of surplus sand as well as even distribution. As soon as the flask is filled, the metering box is shuttled off the flask and heavy ramming backup weights are lowered into position for the jolt cycle.

Following jolting, the peening weights are raised and shuttled out of position. The drag molding machine turret lifts the flask from the jolt table and again turns 180 degrees, rolls the flask over and places it on the hydraulic lift to be lowered onto the flanged-wheel con-

An automatic weight transfer machine eliminates hand clamping by positioning 4000-lb weights at each end of every mold before pouring





Cope molding machine is operated in same manner as drag machine except heavy ramming back-up weights are not used

veyor. It is then shuttle-indexed to the core-setting station.

Mold Assembly—After core setting, the drag flask is indexed to the closing station. Here the drag flask is raised via hydraulic lift to meet the cope flask, which is suspended over the conveyor by a cope setter. The cope molding operation is the same as the drag molding operation except that heavy ramming backup weights are not used. When the mold has been closed, it is lowered to conveyor level and moved to the pouring station.

Before pouring, an automatic weight-transfer device, which eliminates the need for hand clamping, places a 4000-lb weight on each end of the mold. As soon as the weights have been deposited on the mold, an automatic tilt-ladle pours approximately 350 lb of molten iron at about 2700° F into the mold. An overhead conveyor brings the ladle from the cupola where the molten iron has been held in a mixing ladle until needed.

Following pouring, the mold is indexed to the next station where the weights are removed. Then it is shuttle-indexed along the cooling conveyors. The weight-shifting device requires only four weights to sustain its automatic operation.

Shakeout—When the mold is shuttle-indexed to the stripper, a mechanism clamps onto the cope flask, automatically lifts it off the drag flask, and indexes it through the cope shakeout, which is enclosed for dust collecting. Following shakeout, the cope flask is cleaned by a water spray, then indexed to the cope molding station.

After the cope flask has been stripped off the drag flask, the latter is indexed to the next position where the tub casting is pulled out by a worker using an overhead hoist.

The hoist then is conveniently centered over an overhead trolley conveyor on which the casting is hooked and transported into the cooling house. Next, the drag flask is indexed automatically through the drag shakeout and then returned by conveyor to the drag molding station to be recirculated through the system.

Sprues and runners drop into an oscillating pan conveyor under the shakeouts and are raked off into a tote box. Lift trucks move the tote boxes to a central collection point where they are elevated by skip hoist and deposited outside the plant in the scrap yard.

Used sand also is collected below the shakeouts on the oscillating pan conveyor, then elevated by belt conveyors to pass through four vibrating screens on its way to storage bins. The sand system handles up to 300 tons an hour.

When the castings are cool, they are conveyed through an airless blasting machine. Rough edges are ground off in the grinding department either by conveyorized grinding machines or by high-speed rotary air tools. Any surface which is to be enameled must be cleaned again by blasting after grinding. Following these finishing operations, the castings are ready to be enameled.

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The mold handling system's main control panel. All movements in the system are synchronized and are controlled by electric limit switches

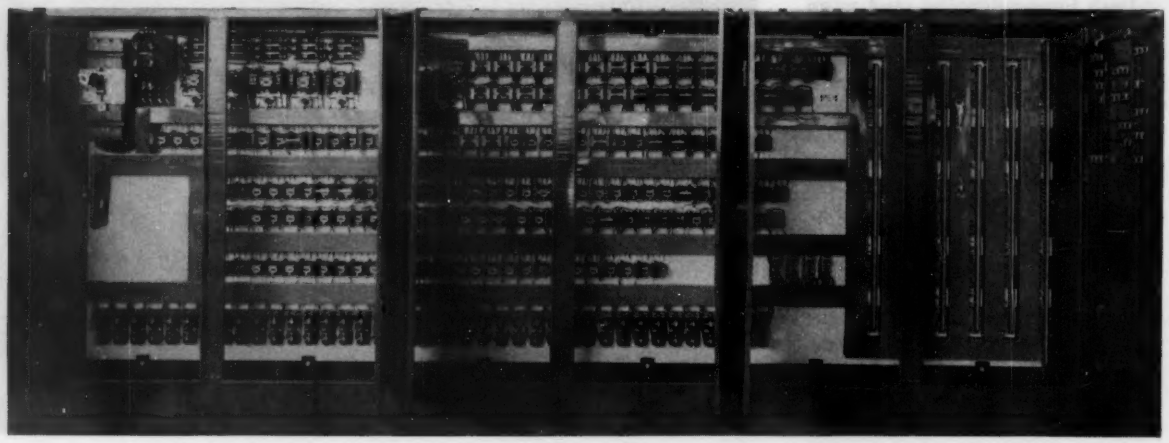

Fig. 1 — This elevator furnace is a common type of batch equipment. Castings must be lifted into the elevated heating chamber

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ANNEALING EQUIPMENT

For the Malleable Iron Foundry

The author discusses elevator, bell, roller hearth, and pusher furnaces in this article. Processing of pearlitic malleable iron and economics of malleablizing are additional topics considered

● THE PERIODIC OVEN has been the mainstay of the malleable iron foundry industry for the last century. Many tons of good quality iron have been annealed in this type of oven. Like so much other obsolete equipment, however, the periodic oven rapidly is becoming a memory.

New demands for product quality and constantly increasing costs necessitate the use of more efficient equipment that provides close temperature control, uniform heat distribution, good furnace atmosphere control, and short annealing cycles. To meet these demands, batch and continuous furnaces such as the elevator, bell, roller hearth, and pusher furnaces have been designed specifically for the malleable industry. The heat source is gas, oil, or electricity. The furnace construction permits the use of either self-generated or separately produced atmospheres.

Elevator Furnaces — A common batch equipment is the elevator furnace, Fig. 1. The equipment consists of an elevated stationary heating chamber which rests on four supporting columns. The furnace hearth consists of an alloy gridwork supported on flexible posts anchored to a refractory-lined car. Small castings are confined in alloy baskets and large castings are loaded directly on the hearth gridwork. The entire car then is elevated into the furnace by a cable-type elevator system. A sand seal extending around the entire periphery of the car provides a positive atmosphere seal.

Both single-elevator and two-elevator combination furnaces are used for malleablizing. With the single-elevator furnace, the charge is heated, held at temperature, and cooled in the same unit.

With the two-elevator combination, which consists of a high-temperature furnace, a low-temperature furnace, and three cars, the cycle is split. The high-temperature furnace provides rapid heating and holding for first stage graphitization, and the low-temperature furnace provides the controlled cooling for second stage graphitization. The operational sequence consists of unloading the high-temperature furnace, transferring the hot load to the low-temperature furnace, and recharging the high-temperature furnace.

The two-furnace combination anneals more iron at lower cost than two single-elevator furnaces because cycles are shorter. In a single furnace the charge, car, and furnace must be heated and cooled. In the two-furnace combination, only the car and charge must be heated and cooled. Heating is more rapid since the hot furnace provides a thermal gradient to the castings. Cooling is more rapid be-

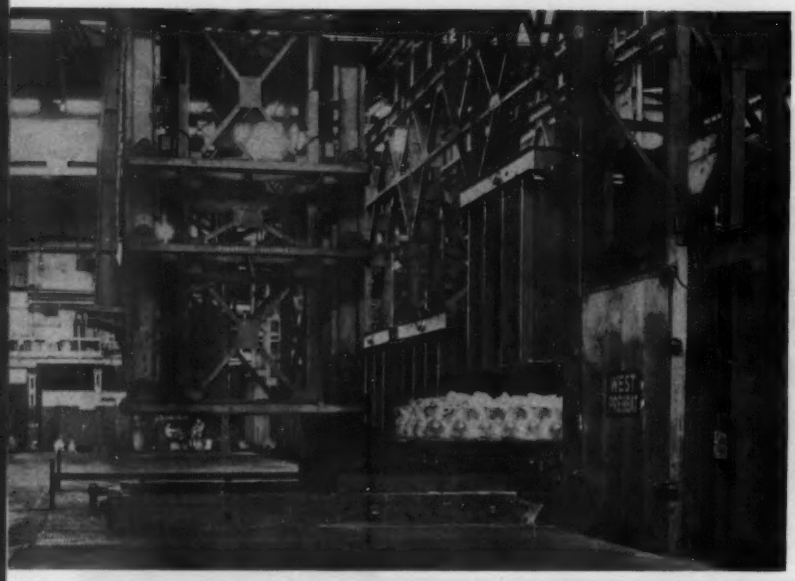


Fig. 2—Another type of batch equipment is the bell furnace. A heating chamber is lowered over the hearth after it is loaded with castings

cause the work is transferred through air and the low-temperature furnace is already at second-stage temperature. Actual field tests show an eight hour saving in over-all cycle with the two-furnace combination.

Bell Furnaces—Another common batch furnace is the bell furnace, Fig. 2. This equipment consists of an alloy hearth supported on flexible posts anchored to a stationary refractory base. The castings are stacked on alloy grids or in baskets before loading onto the hearth. The heating chamber consists of a cylindrical or rectangular bell which is portable. Since the heating chamber does not have a self-contained transfer mechanism, a crane or similar device is mandatory. A sand seal extends around the entire periphery of the base to provide the atmosphere seal.

As in the case for elevator furnaces, either single bell furnaces or combination high- and low-temperature bell furnaces are used. The two-bell, three-base installation processes more iron at lower cost than the single unit.

The operational sequence is slightly different than that for elevator furnaces. For bell furnaces, the hot bell first is placed over the new charge and then the cold bell is placed over the hot charge.

The principal difference between the bell and elevator furnaces is that bell furnaces require a high crane or adequate aisle clearance. However, if a crane is available, the bell furnace offers a capital investment advantage.

A large percentage of the malleable iron produced in the country is annealed in continuous furnaces such as the roller hearth and pusher types.

Roller Hearth Furnaces — The roller hearth furnace, Fig. 3, consists of a horizontal tunnel divided into heating, holding, rapid cooling, and controlled cooling sections. The hearth consists of individually driven alloy rolls. Slab-type and refractory-lined doors are used to prevent contamination of the atmosphere, provide positive atmosphere seals, and reduce energy loss by radiation.

Rapid cooling after first stage graphitization to a temperature slightly above the critical, or where second-stage graphitization starts, is accomplished by means of cooling tubes through which air is blown at high velocities. The roller hearth furnace requires the use of alloy baskets or trays for transporting the castings through the furnace.

The operational sequence consists of transferring the loaded baskets by a hand crane to the charge table. The baskets are automatically charged into the furnace, annealed, and discharged. Then they are dumped automatically and the empties returned to the loading area via a return conveyor.

Pusher Furnaces — The pusher furnace essentially is the same as the roller hearth except that the baskets containing the work move through the furnace on alloy roller trays which ride in alloy channels. In a pusher furnace each tray pushes the preceding tray. The propelling force usually is a hydraulic pusher located at the charge end. Long furnaces also may have hydraulic pullers at the discharge end of the furnace. The operational sequence differs from that of a roller hearth in that the trays and baskets are returned to the charge end of the furnace by means other than a return conveyor.

Both the pusher and roller hearth are highly efficient furnaces. The pusher furnace is restricted in length by the force which the trays can withstand. Roller hearth furnaces are restricted in width due to the loading limits of the alloy rolls. Thus, pusher furnaces usually are shorter, having three baskets abreast, whereas roller hearth furnaces are longer with two baskets side by side.

Malleable iron is annealed in either a self-generated or separately generated atmosphere. The self-generated atmosphere is produced by the evolution of carbon from the iron and subsequent oxidation of this carbon by oxygen or water vapor. Since the carbon is removed from the iron to form a self-generated atmosphere, the charge shows some decarburization. This is not objectionable if the product is machined after annealing. When no machining is desired or when full hardness on the surface is required, however, the optimum product cannot be produced by annealing in a self-generated atmosphere.

A separately generated atmosphere, Fig. 4, such as purified exothermic gas, eliminates decarburizing action within practical limits. Separately generated atmospheres, although usable in batch equipment, are more adaptable and economical to use with continuous furnaces since the quantity of gas required over a period of time is constant. In batch furnaces, high

Economic Analysis, Malleable Iron Annealing Furnaces

	ELEVATOR		BELL		ROLLER HEARTH		PUSHER	
	Electric Heat	Gas Heat	Electric Heat	Gas Heat	Electric Heat	Gas Heat	Electric Heat	Gas Heat
CAPITAL INVESTMENT								
Furnace complete with installation	$230,000	$250,000	$235,000	$258,000	$191,000	$210,000	$175,000	$192,000
Baskets and trays	35,000	35,000	35,000	35,000	19,900	19,900	26,800	26,800
TOTAL	$265,000	$285,000	$270,000	$293,000	$210,900	$229,900	$201,800	$218,800
OPERATING EXPENSE								
Energy cost	$ 3.60	$ 2.18	$ 3.60	$ 2.18	$ 2.92	$ 1.70	$ 2.92	$ 1.70
Basket, tray replacement	0.75	0.75	0.75	0.75	1.00	1.00	1.75	1.75
Furnace equipment material maintenance	1.70	2.30	1.70	2.30	0.33	0.94	0.30	0.91
Maintenance labor	0.30	0.35	0.30	0.35	0.50	0.65	0.50	0.65
Operator labor	2.40	2.40	2.40	2.40	3.00	3.00	3.30	3.30
OPERATING COST PER TON	$ 8.75	$ 7.98	$ 8.75	$ 7.98	$ 7.75	$ 7.29	$ 8.77	$ 8.31

Basis: Batch furnaces—450 kw-hr/ton; continuous furnaces 365 kw-hr/ton; electric energy $0.008/kw-hr; gas $0.50 per 1000 cu ft at 1000 Btu/cu ft; labor at $2.50/hr; loading density 100 lb/cu ft; elevator 4 ton and 6 ton; bell 2–6 ton; production 12 ton/day; batch 48-hr cycle; continuous 40-hr cycle; 3 shift/day; 5 day/wk; 50 wk/yr.

volumes are required at the start to purge the atmosphere, and significantly smaller quantities are needed after the cycle starts. Since atmosphere producers can be operated over only a limited range of output, two producers may be required. If so, there is a capital investment disadvantage and perhaps an operating cost disadvantage also.

Pearlitic Malleable Iron—Pearlitic iron, depending on tonnage and grade, is heat processed in a variety of ways. If the tonnage is small, pearlitic iron usually is made from ferritic malleable iron. If the tonnage is high, pearlitic iron is made from malleable which has received only a first-stage graphitization anneal. The softer or lower strength irons, such as grades 45010 and 45007, are air quenched and drawn. The high-strength irons, such as grades 60003 and 80002, are air quenched, reheated, oil quenched, and drawn.

Both batch and continuous furnaces are applicable for pearlitic iron. In batch equipment, such as the bell and elevator furnace, the iron usually is air quenched after the first stage and then reheated or drawn in other equipment. With a high- and low-temperature furnace combination, iron which has been air quenched could be reheated for oil quenching or drawn in the low-temperature furnace. Continuous pearlitic furnaces usually are designed to permit air quenching after the first-stage graphitization anneal. These furnaces are, in effect, short malleable furnaces.

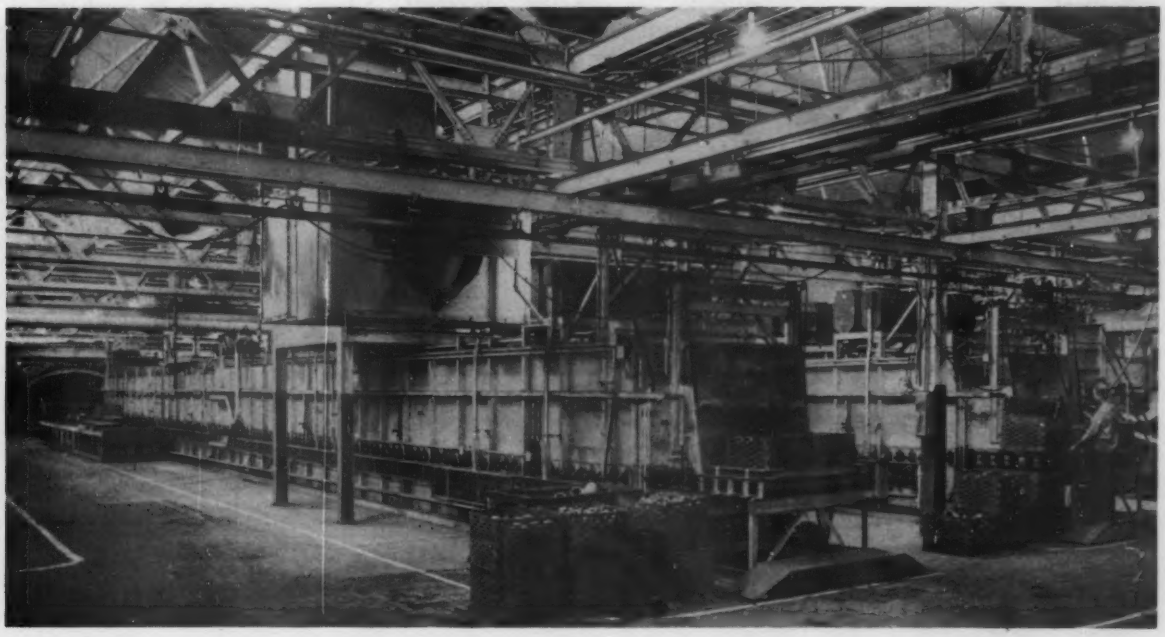
Generally, reheat furnaces are continuous equipment although, as mentioned previously, batch equipment can be used. The most common reheat furnaces are the pusher and cast belt type. This equipment consists of a heated tunnel through which the work is carried on a continuous belt made of interlocked cast plates. Reheat furnaces usually have dump provisions at the discharge for oil quenching. The quenched work is removed from the quench pit by means of a conveyor.

Cast belt furnaces permit direct loading onto the belt and are particularly adaptable for automatic loading. The work is distributed in shallow layers which provide rapid heating and uniform quenching. Pusher furnaces require baskets and a special dump mechanism. Pusher furnaces can be loaded more heavily, and generally they are smaller in size.

Draw furnaces include the cylindrical batch type pit furnace and the continuous cast belt or link belt. The link belt is identical to the cast belt except for the construction of the belt.

For the foundry that produces moderate quantities of both malleable and pearlitic iron, a continuous furnace combination, Fig. 5, consisting of a roller hearth, cast-

Fig. 3—Castings are processed continuously in the roller hearth furnace. Unit consists of sections for heating, holding, rapid cooling, and controlled cooling



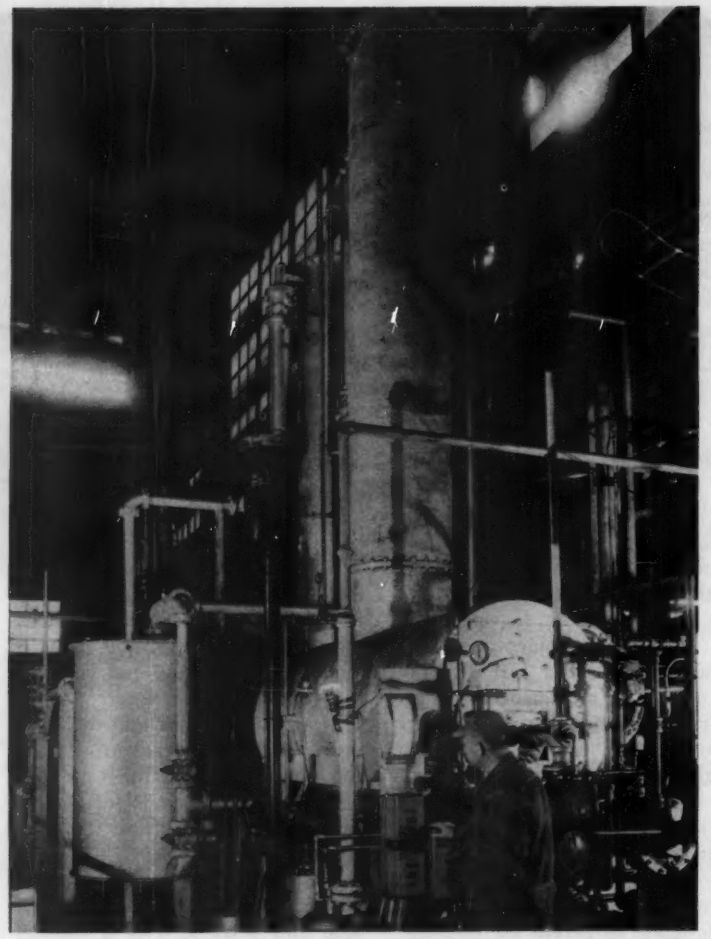


Fig. 4—This equipment generates gases to prevent decarburization. Separately generated atmospheres are utilized most economically with continuous furnaces

belt reheat furnace, and cylindrical draw pit is ideal from both product quality and processing cost considerations.

The roller hearth furnace is similar to the conventional equipment except for a discharge provision after first-stage anneal. When malleable iron is being annealed, the work moves straight through the furnace. When pearlitic iron is required, the work is removed after first - stage anneal, air quenched, and transferred on a chain conveyor to the reheat furnace. After reheating in the cast belt furnace the iron is quenched automatically in oil and then drawn in the pit furnace.

Economics of Malleablizing—An economic analysis normally includes capital investment and total operating cost. Since the rates on depreciation, interest, taxes, and insurance vary with corporate practices and geographic location, the economics presented in this discussion do not include these factors.

The capital expense figures used in this discussion are conservative estimates for complete equipment and installation. Actual investments for similar installations could be lower depending on the type of control, auxiliary components, and installation.

The operating costs shown include energy, basket and tray replacement, furnace material maintenance, operating labor, and maintenance labor. These costs are given per net ton of annealed iron. The specific conditions for each analysis are shown at the bottom of the tables with the exception of maintenance and container costs. These are an average of the costs experienced by several foundries using the particular equipment.

An economic analysis of five conventional coal-fired periodic ovens wherein castings are packed with gravel in malleable pots shows a capital investment of $172,500 and operating cost of $18 a net ton. The five furnaces would anneal an average of 60 to 84 tons of iron a week on a seven-day turnover.

For equivalent capacity equipment the economic analysis of the batch and continuous furnaces discussed previously shows a capital investment of $265,000-$285,000 for the combination high- and low-temperature elevator furnaces, $270,000-$293,000 for the combination high- and low-temperature bell furnaces, $211,000 to $230,000 for a roller hearth and $202,000 to $219,000 for a pusher furnace.

The capital investment for electrically heated furnaces is lower since cost of resistance heating elements is appreciably less than that of alloy radiant tubes, burners, and piping. If, however, additional distribution equipment is required for the electric furnace, the capital investment may favor the gas-heated furnace.

The operating cost per net ton for this equipment is $8.75-$7.98 for elevator furnaces, $8.75-$7.98 for bell furnaces, $7.75-$7.29 for roller hearth furnaces, and $8.77-$8.31 for pusher furnaces. The operating expense is characteristically lower for gas-fired furnaces unless electric energy can be purchased at $0.005 or less per kw-hr or if 1000 Btu gas costs $0.70 or more per 1000 cu ft. A direct comparison of the batch and continuous furnaces with the coal-fired periodics shows a significant operating cost reduction of $9.23 to $10.71 per net ton annealed.

An economic analysis for 5.4 net tons per day shows that pearlitic iron made by reheating, oil quenching and drawing malleable iron would cost $10.25 to $11.25 per net ton more than malleable iron. Pearlitic iron made in this manner would, therefore, cost $17.54 to $20.02 per net ton. The capital investment for the pearlitic equipment is $94,000. Adding this to the malleable equipment shows a total capital investment of $296,000 to $387,000.

If a continuous furnace that has

Comparison of Periodic, Batch, and Continuous Furnaces

	PERIODIC OVENS (Gravel Pack)	BATCH FURNACES	CONTINUOUS FURNACES
ECONOMICS			
Capital investment (12 tons/day)	$172,500	$265,000-295,000	$200,000-230,000
Operating cost per net ton	18.00	8.00-9.00	7.00-8.00
Investment in inventory	60 tons—$36,000	24 tons—$14,400	20 tons—$12,000
PRODUCT QUALITY			
Product consistency (day-to-day, etc.)	Fair	Good	Excellent
Metallurgical and Physical Properties			
Scale control	Fair	Good	Excellent
Decarb control	Fair	Good	Excellent
Distortion control	Excellent	Fair	Good
Machineability	Fair	Good	Excellent
Strength and ductility	Fair	Good	Excellent
General appearance	Fair	Good	Excellent
Dimensional stability	Fair	Good	Excellent
Rework factor	Fair	Good	Excellent
PROCESS CHARACTERISTICS			
Average annealing cycle	160 hours	48 hours	40 hours
Temperature uniformity	Fair	Good	Excellent
Temperature control	Fair	Excellent	Excellent
Automation factor	Fair	Good	Excellent
Versatility	Fair	Excellent	Good
Floor space utilization	Fair	Good	Excellent
Atmosphere control	Fair	Good	Excellent

Cost of Reheating, Oil Quench, and Air Draw Equipment

	Open Gas-Fired Pusher Electric Air Draw	Electric Heat Pusher Electric Air Draw
CAPITAL INVESTMENT		
Pusher furnace complete with oil quench—installed	$68,300	$68,300
Cylindrical pit type air draw furnace—installed. (3 furnaces)	23,400	23,400
Baskets and trays	2,300	2,300
TOTAL	$94,000	$94,000
OPERATING EXPENSE		
Energy cost (pusher)	$ 2.25	$ 3.25
Energy cost (draw furnaces)	1.70	1.70
Basket and tray replacement cost	1.50	1.50
Maintenance—material and labor	0.80	0.80
Furnace operator labor cost	4.00	4.00
OPERATING COST PER TON	$ 10.25	$ 11.25

Basis: Electric energy $0.008 kw/hr; gas $0.50 per 1000 cu ft at 1000 Btu/cu ft; labor at $2.50/hr; three-shift operation; 5 day/wk; cycle 6 hr total for pusher and 4 hr for air draw.

provisions for air quenching after first-stage anneal is used in conjunction with the foremention reheat, quench, and draw equipment, the operating cost for pearlitic iron would be $1.00 to $1.50 less per net ton.

Over-all Considerations—A comparison of economic factors, product quality, and process characteristics indicates that the continuous furnace is best on an over-all basis. Where distortion control is a major problem, the solution is to use the gravel pack method or straighten after annealing. Where versatility is required, the batch furnace is best.

As a result, a foundry that produces small quantities of many different size castings should use a batch furnace. If the product is relatively consistent in size and the production is moderate, the direction should be toward a continuous furnace.

To summarize, there is available to the small foundry much efficient annealing equipment that will produce a high-quality product at a low cost. Each class of equipment has its advantages and disadvantages when process characteristics, product quality, and cost are considered.

The economic data presented in this discussion are indicators of equipment investment and operating costs. With these data, plus a consideration of taxes, depreciation, and other costs for a particular operation, a cumulative cash flow analysis can be prepared. In many instances, cash flow is as important or more important than total operating expense determinations.

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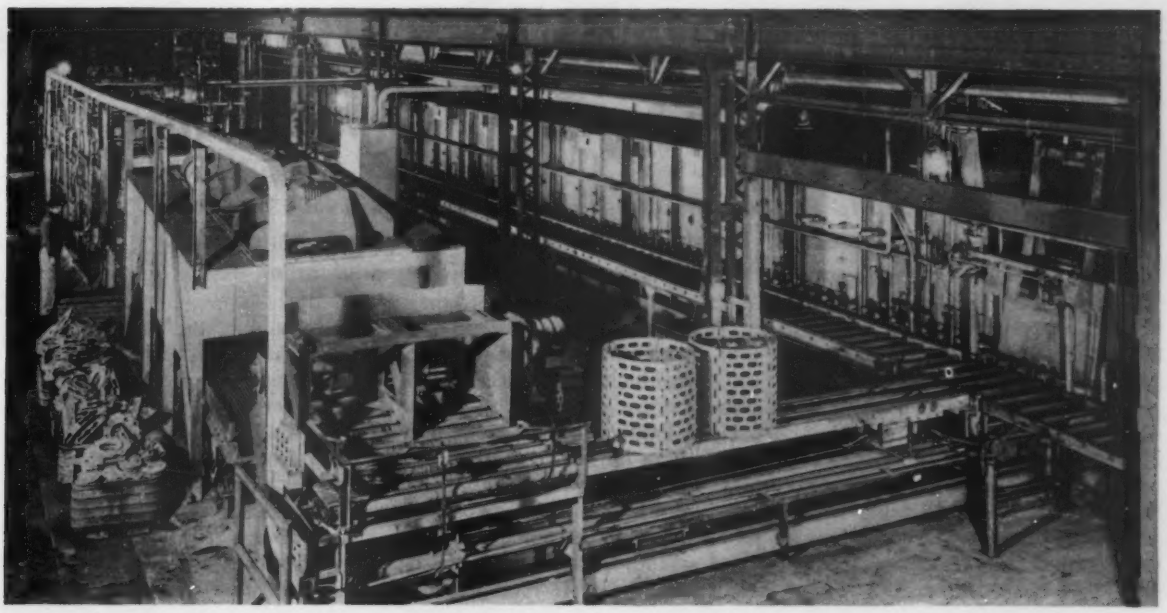
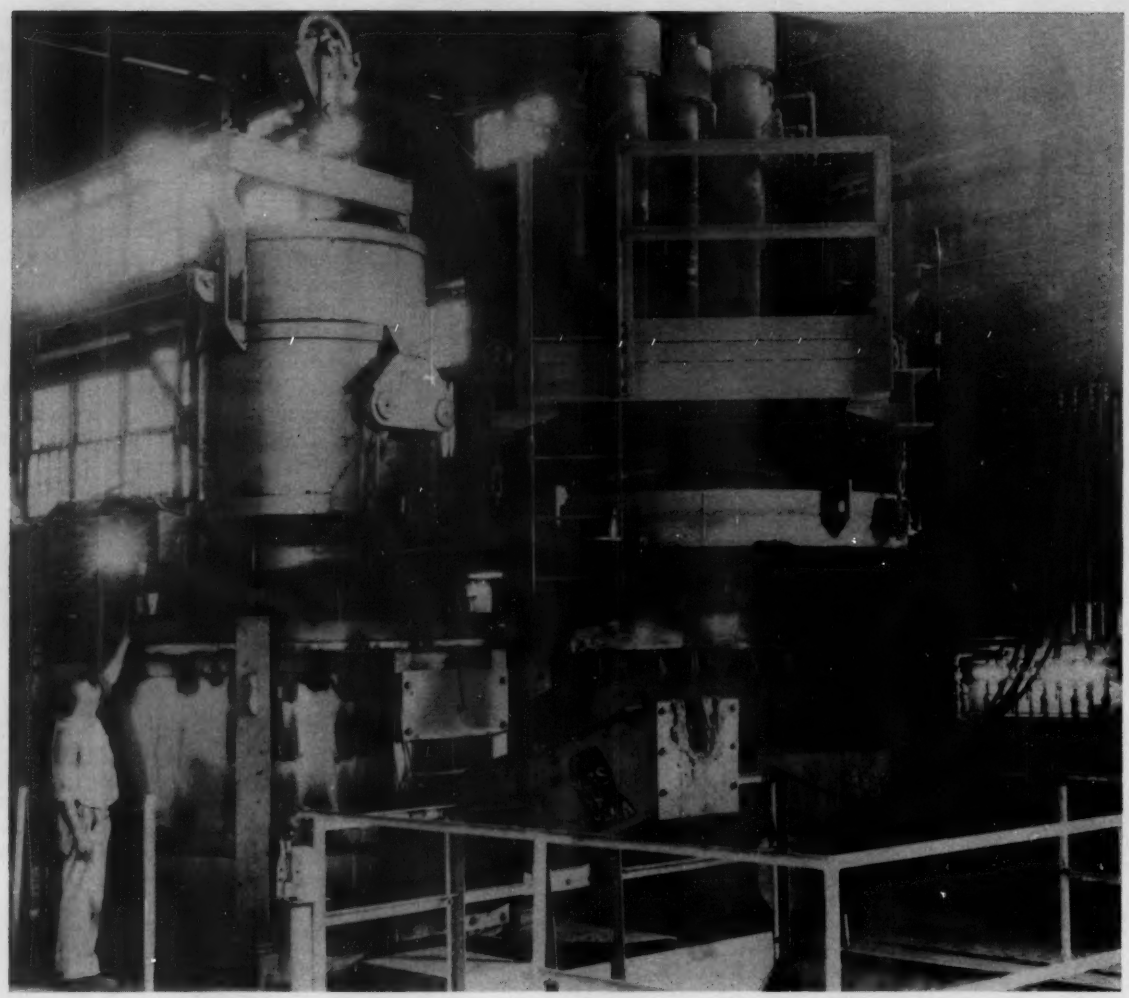
Fig. 5—Furnace combination consisting of roller hearth, cast-belt reheat unit, and cylindrical draw pit can produce moderate quantities of malleable and pearlitic iron





MODERNIZED STEEL

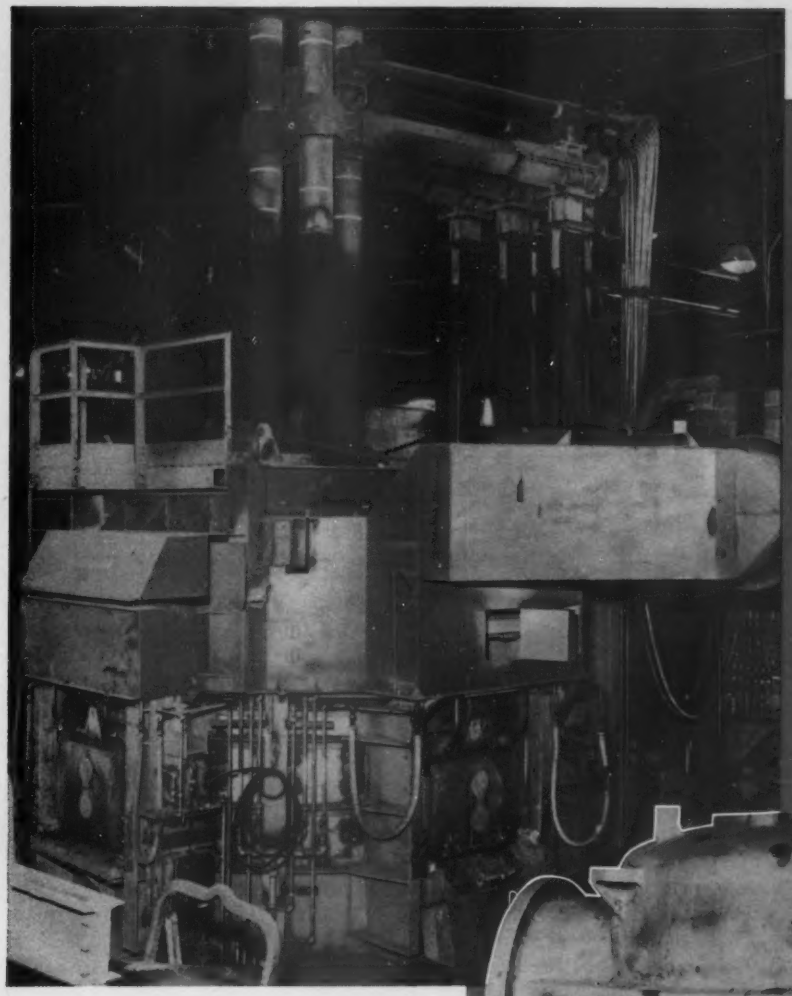
Converts to Electric Furnace Melting

Conversion to electric furnace melting is just one step in the modernization program at Birdsboro Corp. Other new equipment includes core ovens, sand system, shakeout, and molding equipment

● ANOTHER step in a $1¾ million modernization and expansion program at the steel foundry of Birdsboro Corp., Birdsboro, Pa., has been the recent conversion of the plant to electric furnace melting. Two new basic electric arc units, along with a third arc furnace which has been in operation for some time, replace three open-hearth furnaces. As a result, Birdsboro now can melt up to 300 tons of high-quality electric steel a day.

New Products—Production previously was limited to carbon and low-alloy steel castings. With the new melting facilities, management is planning to add production of stainless and other high-alloy steel castings for use in high-pressure, high-temperature, and corrosion-resistant applications.

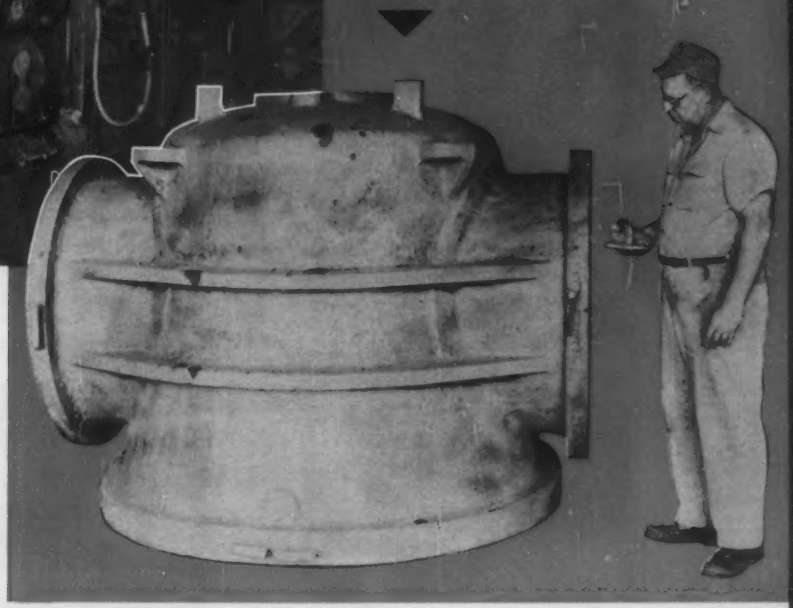
Another advantage is the melt size flexibility; whereas before a minimum-sized melt was about 8 tons, melts as small as 4 tons now are practicable. This added versatility means that the foundry can take smaller orders, schedule heats more efficiently, and offer better service



The new 9-ton electric arc furnace, far left, is shown during charging operations

This large electric arc furnace will handle melts up to 45 tons. Three electric arc furnaces replace three open hearth units

A 10-lb freight car casting and a 14,000-lb valve body for a hydroelectric installation demonstrate Birdsboro's flexibility



FOUNDRY

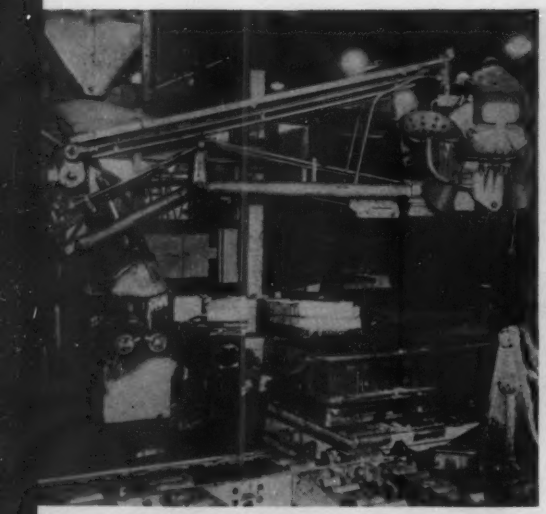
on deliveries to its customers.

The smaller of the new furnaces has an 8-ft-diam shell and a melting range of 4 to 9 tons. Average heat size is expected to be about 5 tons and the melting rate about 2 tons an hour. The larger furnace will handle charges of 20 to 45 tons, with the average estimated at 28 tons. Shell diameter is 13½ ft, and melting rate is 7 tons an hour.

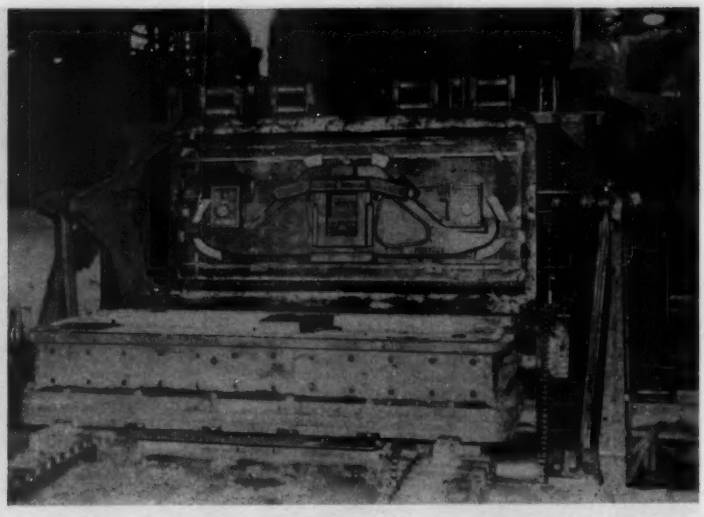
The older electric furnace, which has been in operation for five years, has a melting range of 8 to 20 tons. It has an 11-ft shell diameter and handles an average heat of 15 tons at a melting rate of 5 tons an hour.

More Molding Equipment—Two of the replaced open-hearth furnaces had a capacity of 30 tons each and the third was of 20-ton capacity. Plans call for installation of production type molding equipment in the area made available by removing these open hearths. This molding equipment is expected to increase the foundry's miscellaneous castings capacity from 1050 to 1250 tons a month. Production capacity for cast rolls and railroad specialties remains unchanged—300 and 2000 tons a month, respectively. Castings produced now range in size from 50 to 75,000 lb, and can go as high as 100,000 lb depending on design and linear measurements.

Addition of 15,000 sq ft of floor space is included in the improvement program. Approximately 6000



Stationary sand slinger turns out molds for castings which range in weight between 50 and 500 lb



Roll-over draw machine has a capacity of six tons and operates with the stationary sand slinger

sq ft of the addition has been allocated to enlarging the coreroom and the remaining 9000 sq ft to expanding the molding area. Former walls and partitions in adjoining areas of the foundry were removed to permit more efficient material and work flow, and also to integrate more fully molding and coremaking operations with pouring and shakeout.

A major feature of the plant improvement program is the foundry's new sand handling and storage system. Improved methods now permit better control of sand properties, and cost of moving and storing the sand has been reduced 50 to 60 per cent.

Sand Handling—Incoming sand is discharged from drop-bottom hopper cars into an under-track discharge and conveyor system. It is then dried in a rotating cylindrical gas-fired dryer at the rate of 35 tons an hour. Approximately 30,000 tons of new sand is used in a year.

Dried sand is placed in a new 600-ton storage silo. Proper drying and storage helps to maintain close control over moisture content of the sand.

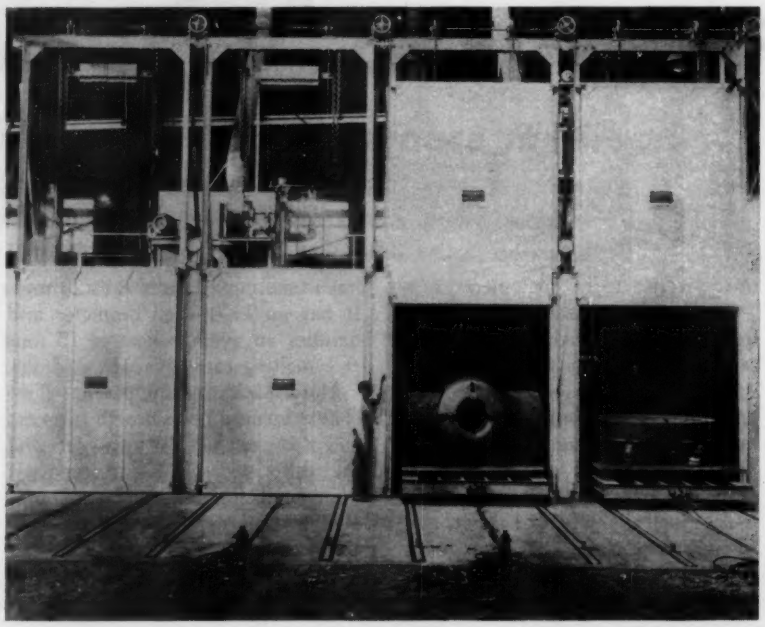
When needed, the sand is taken from the silo and transported through overhead steel pipes 5 in. in diameter, to points more than 300 ft away. Slugs of sand can be moved at a rate of 25 to 30 tons an hour by compressed air. Remote-control switches direct the moving sand through sand mixing stations to two points of use in the foundry and one in the coreroom.

Poured molds are broken down on a new dual-deck 50-ton capacity shakeout machine equipped with dust hoods and auxiliary dust collecting equipment. Tramp metal is separated magnetically from the used sand, lumps are broken, and the sand is thoroughly screened.

After the used sand is processed, it is deposited from a bucket elevator into another 600-ton storage silo behind the shakeout and just outside the building addition. Then, as required, it is taken from the silo by bucket elevator, placed on distribution belts and conveyed to use points or sand preparation stations for reuse. Formerly, the sand was moved from piles on the foundry floor by clamshell buckets and conveyor belts.

The motive slinger section of the

Capacity for core production was increased as much as 30 per cent when this car-type core oven with four compartments was installed



foundry, from the standpoint of material handling, is completely self sufficient and independent of the other molding sections. Most work in this area is done by skin-dried green sand practice. Heavier duty work is accomplished by dry sand practice using portable mold driers.

Continuous Flow—Both the molding and core shops in this section have been reorganized to permit efficient, continuous flow of work. Now it is possible to mold at one end while pouring at the other end. The improved layout permits running a double shift with a corresponding increase in output.

The foundry has installed a stationary type sandslinger in that part of the foundry handling miscellaneous work ranging from 50 to 500 lb in size. The new slinger in this section increases overall flexibility in the production of small castings. Operated in conjunction with this slinger is a new 6-ton capacity roll-over-draw machine with lifting devices, conveyors, and other auxiliary equipment.

Heat Treating—Two new high-temperature heat treating furnaces have been added to existing facilities. They are car-bottom type furnaces, one with 50-ton and the other 100-ton capacity. A recirculating water quench tank has been installed to handle loads of up to 15,000 lb. All heat treating facilities are situated on the foundry cleaning floor.

The company has increased its crane handling capacity with the addition of a 50-ton bridge crane in the motive slinger foundry and a 10-ton crane in the core shop. A four-compartment car-type core oven increases baking capacity by approximately 30 per cent. Each compartment is 8 x 14 ft with an 8-ft door opening. The new oven allows use of dry sand cores, and although it minimizes use of cement cores, the latter still will be used for large work.

As part of a further $45,000 foundry improvement program, the company also anticipates adding new pattern shop facilities and pattern storage.

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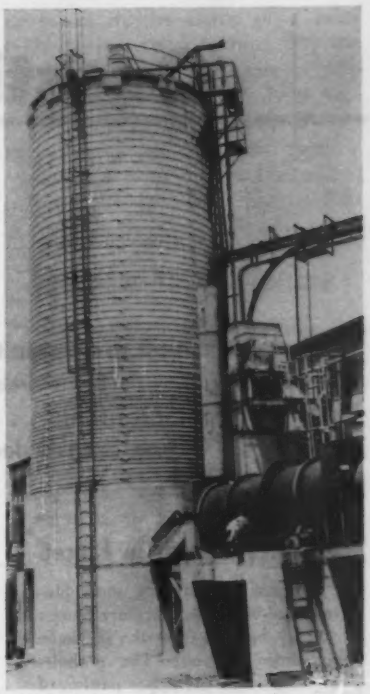


Sand is dried in the gas-fired kiln at 35 tons per hour, then stored in this 600-ton silo

Dual deck shakeout unit has a 50-ton capacity and is equipped with dust hoods and auxiliary dust-collecting equipment

Questions and Answers

Pinholes in faucet spout result from inability of gas to escape through mold . . . Some basic information on making cast iron soil pipe and fittings . . . Surface oxide can be removed easily . . . Gating bronze sleeves

Pinholes Appear in Faucet

We are encountering some pinhole trouble in our lavatory faucets as may be seen from the specimen forwarded to you. The pinholes are located in the upper portion of the spout near the end, and we have not been able to remedy the situation. The alloy is the 78 per cent Cu, 3 per cent Sn, 7 per cent Pb, and 12 per cent Zn alloy melted in indirect-arc electric furnaces. Pattern plate contains four patterns.

Study of the faucet indicates that it is a high quality product resulting from good foundry practice, and there is a minimum of dissolved gas which shows good melting control. Location of the pinholes in the top of the spout leads us to the opinion that they are caused by gases generated by the molten metal in contact with the core.

In the manufacture of plumbing goods such as this faucet, it usually is necessary to have a complex core which only can be vented at the prints into the mold itself. In some cases foundries use corewax to form vents. In any event the gas generated in the core has to escape through the mold at the coreprint locations, and the mold must be sufficiently permeable in those areas to permit that to occur. Use of a vent wire will help.

Possibly the use of less oil in the cores or employment of longer baking cycles might be of value since those practices will reduce the amount of gas generated. Again the ingate for these castings may be near the spout, and arranged so that it permits impingement of metal on the core as well as local overheating. Changing the position of the gate should aid in minimizing the condition.

Mold Soil Pipe and Fittings

Could you supply us with information on how soil pipe and fittings are molded and cast? What kind of cores are used and how are they made? Can you tell us the usual range of analysis, and give details on gating and risering? Is there any book on making soil pipe and fittings?

Over a period of time articles have been published on different phases of production of soil pipe and fittings, but as far as we know there is no book on the subject. Soil pipe is made in three classes—standard, medium, and heavy which are ⅛ in., 3/16 in., and ¼ in. thick, respectively. Greatest production is in the standard class. Composition range is 1.75 to 2.00 per cent Si, 0.75 per cent P, 0.45 to 0.50 per cent Mn, and 3.40 to 3.50 per cent TC.

Due to space limitations only a brief summary can be presented on the methods of manufacture. Long straight lengths in either bell and spigot, or two bell ends are made in close-fitting cast iron or steel flasks. Patterns for pipe up to 6 in. in diam are mounted in pairs, and over that, singly.

Sprues and gates usually are arranged to take metal from a large, elongated, multi-lip ladle suspended from a crane or monorail. A central runner between two castings feeds thin flat gates spaced about 2 in. apart. Four sprues equidistantly spaced lead to the runner. Methods of mold making vary, and they may be made on machines or rammed by hand.

In some plants the pattern is dropped part way through a stripping plate before the half mold is lifted. In others, the half mold is lifted directly from the rigid pattern and plate. A small fillet at the joint line assures a clean lift, and a vibrator attached to the plate is kept in operation during the lift.

Cores for the pipe are made on cast iron or steel pipe arbors perforated with numerous closely-spaced vent holes. Ends of the arbors are machined to fit closely in circular openings formed in the ends of the flasks. Finely screened sand for the cores is stored in an overhead hopper. The arbors are clay-washed or dipped in water, and placed on a stand under the hopper. The stand is provided with bearings corresponding to the machined ends of the arbors.

A crank handle for handwork or a simple type of clutch for mechanical handling is fitted to one end of the arbor to revolve it while a thin stream of sand falls from the overhead hopper. A flat strike or blade contoured at one end to form the bell rests on the stand, and imparts the correct shape, thickness of sand, and smoothness to the core. Cores are not coated, and are used green.

Molds for pipe fittings are made by hand or on machines. The arbor which may be plain or in the form of a backbone with a number of semicircular wings cast on, occupies space in the lower half of the corebox. Corebox is made in halves which may or may not be hinged.

For some shapes a shell pattern serves for pattern and corebox, and

is split horizontally through the center. On cores provided with three or more bearing points, short core prints will suffice. On bent pipes with only two bearing points, it is necessary to prolong the bearings and arbor ends to resist the lift of the metal as it flows into the mold.

Can Clean Surface Easily

Please advise us if it is possible to obtain a surface free of oxide in bronze castings. Phosphor bronze proves a little too hard for our purpose.

Your reference to a surface free of oxide on bronze castings is not clear to us, but we assume that you mean surfaces that exhibit dark, discolored patches instead of a uniform reddish color. Such discoloration may be removed by blasting with copper shot or with sand, or by acid dipping or pickling. Blasting with copper shot is preferable to sand since no metal is removed in the process.

In acid dipping or pickling, a solution composed of 12 oz sulfuric acid with 4 oz of sodium dichromate per gallon of water may be used to obtain a semibright finish. Lead-lined or ceramic stoneware tanks should be used to hold the solution. After dipping, the castings are rinsed in running water then dipped in hot water containing ⅛ to 1 oz of soap per gallon, and allowed to dry.

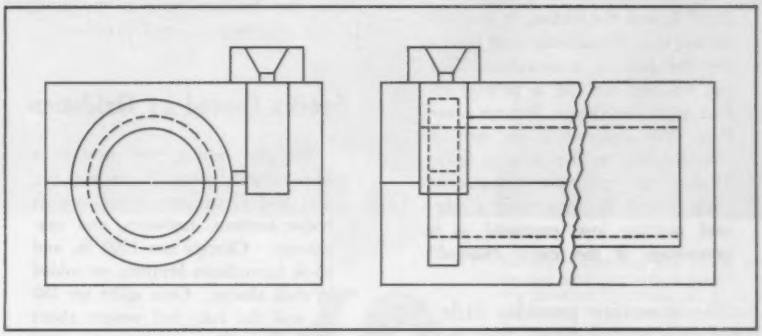
Without any indication on what type of service the castings will be subjected to, it is difficult to suggest a suitable alloy. Perhaps the 85-5-5-5 copper-base alloy containing 5 per cent each of tin, lead, and zinc, and commonly referred to as ounce metal might serve your needs. It is used widely for small valves and fittings and for general castings.

Gating for Aluminum Bronze

We are trying to produce some aluminum bronze sleeves 3⅝ in. ID with ⅜ in. walls, 15¼ in. long, and flanged at one end. The alloy contains 81 per cent Cu, 4 per cent Ni, 4 per cent Mn, and 11 per cent Al. We are unable to control the oxide inclusions, although we have tried gating by several different methods to prevent turbulence.

Alloy is melted with natural gas, and we have tried temperatures from 1900 to 2200° F in 100° increments without success. The oxide is not consistently in the same place. Combustion tests of the furnace atmosphere show it to be slightly oxidizing. Molds have been green sand, skin and oven dried, and with and without graphite coating.

Important factor in producing castings from aluminum-bearing copper-base alloys such as aluminum bronze and manganese bronze is to introduce the molten metal into the cavity with minimum turbulence. In many cases that is accomplished by arranging the gating system so that the entrance point for the molten metal is at the lowest point in the mold cavity. Where the cavity essentially is all in the cope, attachment of the gate is not difficult, but where it is mainly in the drag, a horn-type gate will have to be used.



Possible method of gating a bronze sleeve casting

However, that is not the most convenient method of gating, and often the desired results can be obtained by some modifications to the more commonly used gating procedure of placing the gate at the joint. In the accompanying sketch we have indicated a modification of a gate applied at the joint of the sleeve casting. In this method of gating, a choke is placed on top of the riser, which in turn is attached to the flange through a short gate. For a start we suggest a 2-in.-diam riser with a choke about ½ in. in diam at the top. Gate into the casting cavity is about ½ in. square.

If that procedure does not provide suitable castings, you will have to try horn gating. In this the horn gate may be made of wood or metal in the shape of a horn with the large end opening into the casting cavity. Also the horn gate can be made of uniform cross sectional area in the form of a core which is dropped into an opening made by a print on the end of the pattern.

Alloys for Plaster Molding

We are familiar with the plaster molding process since we make pressure-cast matchplates, and now are considering production of close tolerance copper-base alloy castings. We tried the 85-5-5-5 alloy, and would like to know what noncorrosive alloy will cast smoothly in plaster molds.

Although not indicated, we suspect that you are having difficulty in obtaining a satisfactory surface on the 85-5-5-5 alloy. That is not unexpected because trouble is encountered with copper-base alloys containing more than 1.5 per cent lead when poured in plaster molds. Possibly some improvement might be obtained with the 85-5-5-5 alloy by heating the mold to a temperature whereby calcination occurs. We believe it advisable, however, to turn to copper-base alloys low in lead such as yellow brass, manganese bronze, aluminum bronze, silicon bronze, etc.

One yellow brass employed for castings made by the plaster molding process contains 57 to 62 per cent Cu, 1 to 2 per cent Sn, 0 to 1.5 per cent Pb, and remainder Zn. The alloy additionally may contain up to 0.5 per cent each of Al, Mn, Fe, and Ni. Since elevated temperatures tend to cause disintegration of plaster molds particularly on extended exposure, it is advisable to limit the pouring temperature of

heavy section castings to 2000° F. For small, thin section castings, however, the temperature may run up to 2300 to 2350° F.

Loss of Zinc Appears High

We are melting about 3½ million lb annually of a leaded brass alloy in gas-fired reverberatory furnaces. Alloy contains 83 per cent Cu, 4 per cent Sn, 6 per cent Pb, and 7 per cent Zn, and we are experiencing high melting losses. Furnace atmosphere is checked with an Orsat apparatus which shows 9 to 11 per cent CO_2, 0 to 0.5 per cent O, and 0.5 to 1.5 per cent CO.

Charges are 40 per cent secondary ingot and 60 per cent foundry returns, and cold charges of 1150 lb are melted in 40 minutes. Tapping temperature seldom exceeds 2200° F, and the furnace is emptied in less than 10 minutes after reaching the pouring temperature. We use 0.5 per cent of a proprietary flux with the charge, but no cover flux. We replenish 3 per cent of the zinc loss in the pouring ladle. Under the particular conditions, what would be considered a normal melting loss, expressed as a percentage of the metal charged?

The literature provides little information on melting loss in reverberatory furnaces. That probably is due to the reluctance of many foundrymen to discuss certain phases of their operations, and to the fact that determination of actual melting loss is not a simple matter.

In his book, *Brass and Bronze Foundry Practice*, St. John points out that the only reasonably accurate method is to weigh the metal into and out of the furnace, making sure that the metal charged is clean and free from appreciable nonmetallics. Skimmings and spills at the furnace must be treated to recover the metallics which are included in the weight from the furnace. He also states that the operation practically is a laboratory job which has to be done under unfavorable conditions.

We note from the phrasing of your question that you realize that such factors as type of charge, metal temperature, melting time, etc., will have an effect on the melting loss, but all we can do is offer some information relating to different operating conditions which should be of value. In this instance the alloy melted is the same as yours. Charges contain ingot, returns, and less than 10 per cent borings. Charges weigh 1200 lb and are melted in 30 minutes at a temperature of 2350° F. Total metal loss during melting is indicated as about 4 per cent. Of that percentage 1.5 per cent is the zinc loss.

We are not quite clear on your statement of replenishing 3 per cent of the zinc loss in the ladle. Taken at its face value, it means that you are losing only 2.4 lb of zinc per 1150 lb charge, or about 0.2 per cent, which hardly seems probable under direct flame melting conditions. However, we suspect that it means that the zinc addition to the ladles is equal to 3 per cent of the total metal charge. In that case, the loss in zinc is twice that in the operation cited previously.

Sparks Caused by Oxidation

We are melting gray iron in a 54-in. cupola using 25 per cent pig iron and 75 per cent scrap such as boiler sections, radiators, and machinery. Charges are 1200 lb, and 15-lb ferrosilicon briquets are added to each charge. Coke splits are 180 lb, and the coke bed weighs about 2200 lb. The pig iron contains around 2.50 per cent Si, and the iron over the spout shows about 2.25 per cent Si. We have a problem in that on random days we find sparks flying from our mixing ladle. That condition lasts all day, but the next day there is no sparking. When the sparking condition exists we have a greater chill in our chill test bars. Addition of crushed ferrosilicon in the ladle reduces the chill but does not eliminate the sparking.

Since no melting rate is shown we assume that a normal rate of 11 tons per hour is being produced. If the melting is more rapid, we can expect oxidation in the cupola to increase. Amount of return scrap in the mix is not indicated, and presumably it is part of the 75 per cent scrap portion of the charge.

Sparking of the iron indicates oxidation either from conditions inside the cupola or from the type of scrap used. Without knowledge of melting or wind rates, and since 180 lb coke to 1200 lb iron is being used, we will assume that oxidation taking place within the cupola is normal. Increase in chill tendency increases with oxidation, and since the occurrence is spasmodic, we would look for trouble in the type and condition of scrap iron charged.

Hard iron, badly rusted, or burned iron in the charge will cause the conditions noted. This can be checked by carefully selecting the scrap for several days and observing the results. Leave out the shop returns during the test since that material will reflect the bad condition previously encountered. That is noticeable with low pig iron and more noticeable when returns constitute a large portion of the charge. Also since small coke causes poor air distribution, it is advisable to screen the coke over a coke fork with every other tine removed.

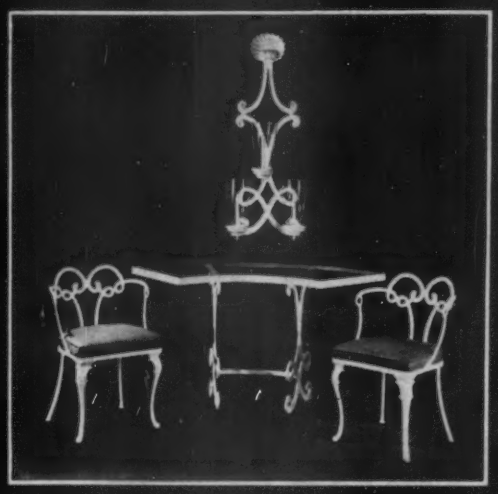
Another possible cause of your trouble is the lack of uniformity of bed height. You mention that you use about 2200 lb of coke in the bed, and the assumption is that it is placed by weight rather than by volume.

Best procedure is to establish the proper height above the tops of the tuyeres and measure the bed height by extending a rod from the charging door each time after the bed had burned through thoroughly. According to *The Cupola and Its Operation* the bed height for a 54-in. cupola, depending upon the wind pressure, may vary from 45 to 51 in. above the tops of the tuyeres.

Can Use Same Type of Sand

Presently we are engaged in producing gray iron castings weighing up to 8000 lb by the dry-sand molding process. We are contemplating the manufacture of brass castings weighing up to 4000 lb, and would like to know what kind of sand to use for the latter and especially if the same sand could be used for both kinds of castings.

With the dry-sand molding process, we can see no reason why the same sand cannot be used for producing both gray iron and brass castings. It seems to us that the main consideration would be surface finish of the brass castings, and that could be taken care of by use of a suitable mold coating which will fill the pores between the sand grains, and provide the desired smooth surface.



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Hercules Tower, 910 Market Street, Wilmington 99, Delaware

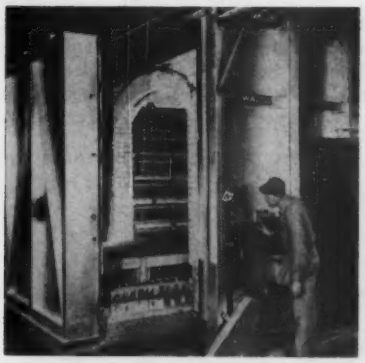
NF60-1

For More Information Use Reader Service Card—Page 55

What's New in Equipment and Supplies

CAR BOTTOM FURNACE

Connections for fast or slow rates of heating are featured in company's electrically heated car bottom furnace. Heating elements are mounted in side walls, on the rear wall, on the door, and under the hearth. Elements are delta connected for fast heating and star connected for slow heating. Differing heat rates are accomplished by contactors. Maximum temperature of the furnace is 2000° F. It is 5 ft wide by 5 ft high and operates on a 440-v, 60-c, three-phase current at 220 kw. The car is moved in and out by a motor driven rack and pinion assembly.—**Waltz Furnace Co.**, Dept. 29, 1901 Symmes St., Cincinnati, Ohio.



For More Details Circle No. 450—Page 55

AIR LINE FILTER

Crown compressed air line filter with a self-draining feature has been added to company's line of filters. Offered in ½ in. through 1 in. pipe sizes, unit employs a drain valve which opens when liquid level in the bowl reaches a predetermined level. The valve closes when the liquid drops to a low point during discharge. The small amount of liquid always remaining in the bowl serves as a seal to prevent air leakage. A sump is provided in a plug to collect and remove solids from the bottom of the bowl. Also, the valve can be removed for inspection and cleaning.—**Hannifin Co.**, Dept. 238, Des Plaines, Ill.

For More Details Circle No. 451—Page 55

MOLD JACKETS

Slip jackets made of ½-in. asbestos compound are said to be unaffected by runouts and spill-overs. Corners of the jackets are 2 x 2 x ⅛-in. angle and sides are reinforced by 1 x 1 x ⅛-in. angle. The asbestos can be replaced when required. Units are made to customer's specifications.—**Arco Welding Service**, 4727 S. Hoyne Ave., Chicago 9, Ill.

For More Details Circle No. 452—Page 55

TEMPERATURE INDICATORS

Temperature indicating crayons and paints are available which can be used in industrial or commercial application where temperature and its determination are factors. These temperature measuring materials indicate the temperature of any hot surface by distinct changes in their color and can be used on all hot surfaces.

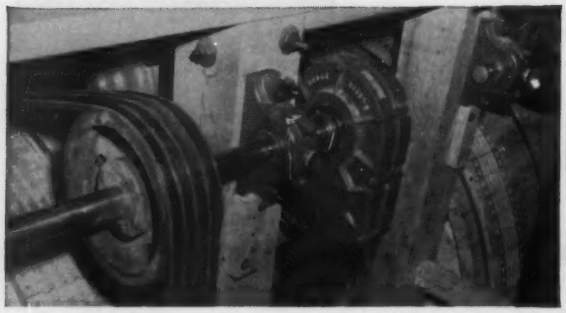
Sulfur and ammonia affect a few of the paints, but have no effect on the crayons. The color change signal is visible at a distance, and application of these materials allows accurate measurement even by unskilled workers. Paints are useful when large areas are to be monitored, when the temperature indicator must be applied before heating, and when the temperature range exceeds that of the crayons. —**Air Reduction Sales Co.**, division of Air Reduction Co., 150 E. 42nd St., New York 17, N. Y.

For More Details Circle No. 453—Page 55

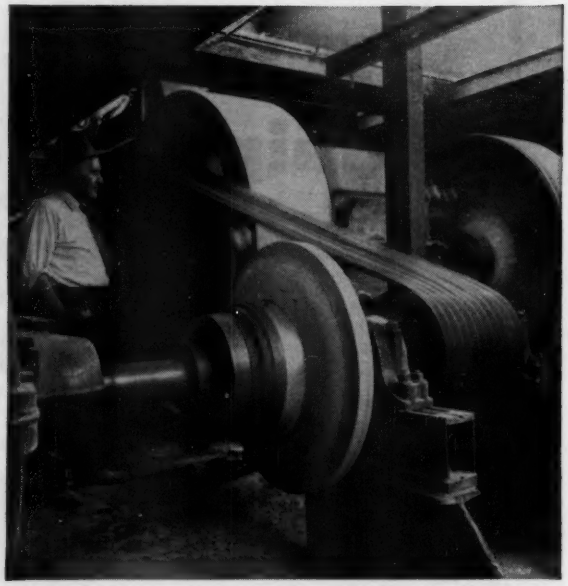
MAGNET CHAIN ASSEMBLY

Bell-type magnet chain assembly is made up of an alloy bell casting and heat-treated alloy steel chain. All legs are straight at a 120-degree angle from the bell to the magnet for even weight distribution. At rest, the bell stands upright and

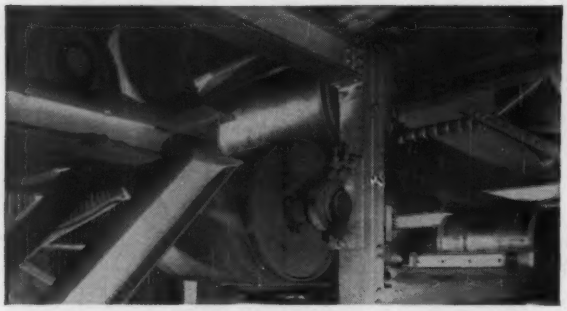
How Dodge pillow blocks with Timken® bearings give longer life with less maintenance



1. Two 2 7/16" Dodge Special Duty pillow blocks equipped with Timken® tapered roller bearings, support the line shaft driving six by eight foot tanning drums. The tapered design of Timken bearings enables them to take both radial and thrust loads in any combination.



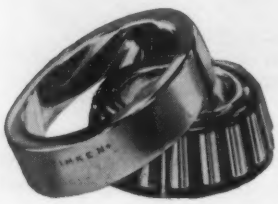
2. The crusher at a trap rock and asphalt plant runs faster, gives more production now that Dodge Double Interlock pillow blocks on Timken bearings are installed. The Timken bearings in these blocks give full-line contact between rollers and races for greater load carrying capacity.



3. The Timken bearings in All-Steel Dodge pillow blocks must stand up under adverse operating conditions found when sintering metals. One major advantage of Timken tapered roller bearings is their ability to hold housings and shafts concentric, thus keeping lubricant in, dirt and dust out.

The photo at right shows the Dodge All-Steel pillow block Timken bearing equipped. The specially designed bearing has a tapered bore with self-aligning spherical outer surface—never needs adjustment.

There's a Dodge pillow block equipped with Timken bearings to fill every engineering need: All-Steel, Type "E", Double-Interlock, Type "C" and Special Duty. And with Timken bearings, space consuming thrust devices are not needed. Look for Timken bearings in all the machines you buy or build. They're the symbol of quality. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits. Canadian Division: Canadian Timken, St. Thomas, Ont.



Industry rolls on

TIMKEN®

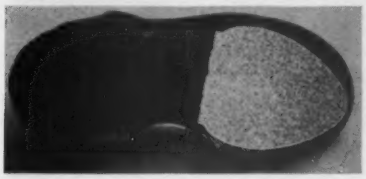
tapered roller bearings

the crane hook can be engaged without help. The bell uses 1 or 1⅛-in. chain and will fit all magnets up to 60 in. diam.—**Campbell Chain Co.**, York, Pa.

For More Details Circle No. 454—Page 55

SAFETY SOLE

Safety sole with adhesive back can be applied to boots, rubbers, galoshes, or shoes for positive footing on almost all surfaces. Sole is made of resinous abrasives and features an



adhesive that is said to be unaffected by water, oil, or gasoline. It will not conduct electricity and eliminates slipping and skidding on wet, oil-covered, or icy surfaces.—**Weather Walker Products**, 192 W. Montana Ave., Detroit, Mich.

For More Details Circle No. 455—Page 55

TENSILE TESTER

Tensile-testing machine with up to 40,000 lb capacity is offered in two models. Model TE-40 has single load gage while model TE-40-A has twin gages with gage selector valve. Unit is vertical, floor-mounted, and motorized with hydraulic system located within the base of the machine. Outside dimensions are 72 x 24 x 23 in. and shipping weight is 1050 lb. Stroke of the machine is 4 in. and specimens up to 10 in. long by 2 in. wide can be accommodated. One set of jaws, either flat or round, is furnished. Standard jaw capacities available are 0 to ⅜ in. or ⅜ to ½ in. for flat specimens and ⅛ to ¼ in., ¼ to ½ in., or ½ to ¾ in. for round specimens. A pair of compression plates also is supplied for compression testing. — **Steel City Testing Machines Inc.**, 8817 Lyndon Ave., Detroit 38, Mich.

For More Details Circle No. 456—Page 55

ROLLING POWER UNIT

Rolling electric power unit eliminates manual pushing or dragging of heavy loads when it is attached to hand propelled equipment. The wheel of the unit carries only its own weight and rides up and down with irregularities in the floor so that constant traction is maintained with the surface. The handle can be placed in the best natural position for minimum effort. Three buttons on the handle provide for control of forward or backward movement and braking. Unit has a 12 v dc motor, fluid drive or centrifugal clutch, and speed of 2½ mph. Model for 3000 lb maximum capacity has a 10 x 3-in. drive wheel and a handle control mechanically operated brake. Model for 8000 lb maximum capacity has a 10 x 4-in. drive wheel and an automatic deadman brake.—**Colson Corp.**, 7 S. Dearborn St., Chicago, Ill.

For More Details Circle No. 457—Page 55

SALAMANDER

Salamander No. 1412 has a maximum capacity of 150,000 Btu per hr at 100 psi. Unit operates without pressure regulator and burns LP gas. Features include 14 in.

diam base made from 13 gage steel, high pressure hose to connect to the fuel cylinder, and an optional excess flow check.—**Insto-Gas Corp.**, 998 E. Woodbridge, Detroit 7, Mich.

For More Details Circle No. 458—Page 55

EPOXY TEST

TwinWeld epoxy adhesive is said to be engineered for a permanent adhesion of a variety of materials for tooling, sheet metal, and other industries. It is reported not to expand or contract and is said to be resistant to acids, alkalies, grease, and solvents.—**Fybrglas Industries**, division of Schramm Fiberglass Products Inc., 3010 W. Montrose Ave., Chicago 18, Ill.

For More Details Circle No. 459—Page 55

REFRACTORY MATERIAL

New refractory material is used to make embedded heating element plates and element supports in company's Type 1700 furnace. The material is reported to retain three basic requirements over a long use-life: Good thermal conductivity, mechanical rigidity, and electrical resistivity. A combination of a metallic oxide and other ingredients is said to provide a chemical bond which provides the reported properties and has high resistance to thermal shock. — **Thermo Electric Mfg. Co.**, 622 Huff St., Dubuque, Iowa.

For More Details Circle No. 460—Page 55

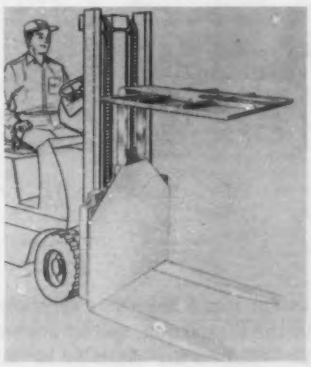
POLYETHYLENE FACE SHIELD

Face shield weighs only 3¼ oz complete with 6 x 11½ x 0.020-in. window. It features replaceability of any of its parts and permits use of a variety of windows or screens. The headband is of pliable polyethylene adjustable in ⅛ increments from size 6⅝ to 8. It can be cleaned with any detergent or soap and is claimed not to mildew, rot, or sour. The vulcanized fiber window deflector is said to pivot easily and to remain secure in any working position on friction joints. —**Fibre Metal Products Co.**, Fifth & Tilghman Streets, Chester, Pa.

For More Details Circle No. 461—Page 55

LOAD STABILIZER

Load stabilizer is for use with any make or model lift truck to hold loads in position around corners, up and down steep ramps, or over uneven surfaces. Unit employs a thin



articulating pad for minimum clearance in stacking, loading, or unloading. It is of all-welded construction with hardened slide bars, full-

floating cylinder, and pilot-operated check valve which insures against loss of clamping pressure. Stabilizer can be combined with side-shifter, rotator, or hydraulic clamp for special applications, and opening and closing ranges can be furnished to suit any load height.—**Little Giant Products Inc.**, Peoria, Ill.

For More Details Circle No. 462—Page 55

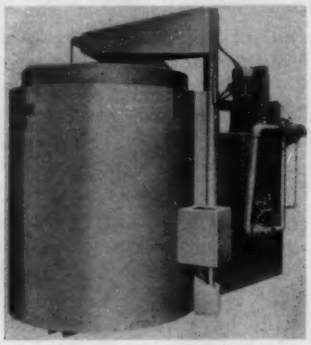
UNIVERSAL TEST MACHINE

Universal testing machine has five ranges, 0.10 lb to 0-300 lb, combined on one 8-in. dial. Calibration is available in ounces, tenths of pounds, or kilos. Changes in grips adapt the instrument for tests of tensile, compression, transverse, and shear forces. These Model M testers are supplied with a manual or motorized handwheel and have controlled temperature cabinets with working ranges from room temperature to 400° F.—**W. C. Dillon & Co.**, 14620 Keswick St., Van Nuys, Calif.

For More Details Circle No. 463—Page 55

HEAT TREAT FURNACE

Pit-type Rotair heat treating furnace is available for tempering, annealing, solution heat treating, or aging. Two temperature ranges are

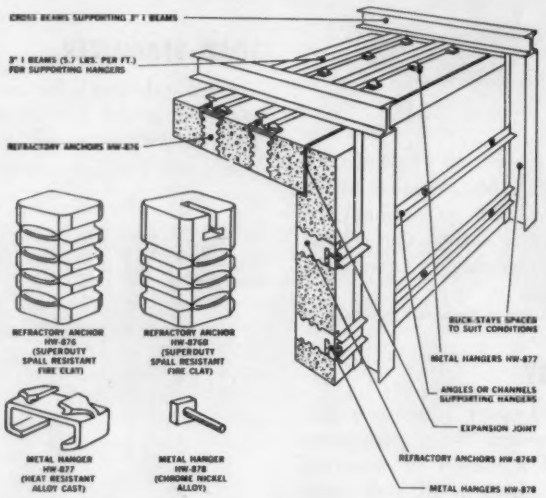


provided—up to 1350° F for the lower range and up to 1700° F for the higher range. Heat is provided by either gas or electricity. A high-speed fan circulates heated air for even temperature distribution. Cover operation features pneumatic lift and manual swing-out. Parts can be suspended or placed in baskets for treatment.—**Hevi-Duty Electric Co.**, 304 W. Hart St., Watertown, Wis.

For More Details Circle No. 464—Page 55

Refractory Anchors Support Monolithic Lining

Anchoring arrangement for monolithic furnace linings consists of a combination of refractory-type anchors and heat resistant metal hangers. As shown in the illustration, special anchors and hangers are available for side and top applications.


CROSS BEAMS SUPPORTING 3" I BEAMS
3" I BEAMS (5.7 LBS. PER FT.) FOR SUPPORTING HANGERS
REFRACTORY ANCHORS HW-876
REFRACTORY ANCHOR HW-876 (SUPER DUTY SPALL RESISTANT FIRE CLAY)
REFRACTORY ANCHOR HW-876B (SUPER DUTY SPALL RESISTANT FIRE CLAY)
METAL HANGER HW-877 (HEAT RESISTANT ALLOY CAST)
METAL HANGER HW-878 (CHROMIC NICKEL ALLOY)
BUCK-STAVE SPACED TO SUIT CONDITIONS
METAL HANGERS HW-877
ANGLES OR CHANNELS SUPPORTING HANGERS
EXPANSION JOINT
REFRACTORY ANCHORS HW-876B
METAL HANGERS HW-878

Principal advantages of properly applied anchoring systems are simple installation, savings of time and money, and extended service life. A complete line of metal and refractory anchoring systems is available to meet needs of castable and plastic refractory installations. — **Harbison-Walker Refractories Co.**, 307 Fifth Ave., Pittsburgh 22, Pa.

For More Details Circle No. 494—Page 55

POLISHING DISCS

Pellon polishing discs for preparing metallographic specimens have a pressure sensitive adhesive on the back for quick fastening to the polishing wheel. Discs may be used with either water or kerosene lubricants. Offered in five standard sizes, the discs are claimed to reduce polishing time, eliminate nap whip so that specimens with sharp corners are produced, and utilize all polishing compounds to best advantage. — **Geoscience Instruments Corp.**, 142 Maiden Lane, New York 38, N. Y.

For More Details Circle No. 465—Page 55

CONVEYOR IDLERS

Conveyor idlers added to company's line are designed to offer more carrying capacity than conventional 20-degree idlers. The 35-degree idlers can handle heavy materials such as sand, crushed stone, and ores and the 45-degree idlers are for lighter materials. Conveyors equipped with deep trough idlers are said to permit greater capacities than the same conveyors with 20-degree idlers because of greater cross-sectional loads.—**Link-Belt Co.**, Dept. PR, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 466—Page 55

INVENTORY COUNTER

Mark-counter combines the operations of marking and counting inventory items. Each time an item is touched with the pen tip, it leaves a small spot of ink and the counter clicks once. Unit comes in a kit with five different color pens so that a different pen can be used for each inventory period. Principal parts are nickel and chrome-plated and the kit comes in a plastic case for carrying and storage.—**Van D. Mark**, P. O. Box 44, St. Clair, Mich.

For More Details Circle No. 467—Page 55

JIB CRANE

Power-rotated jib crane has a load capacity of 20 tons. Unit is available with jib spans up to 25 ft and with clearances up to 25 ft. An ac elec-

3M Abrasives Boost Aluminum Grinding Output 50%

Cast aluminum transformer heads are manufactured here at National Aluminum's Peoria, Illinois, plant. Gates, risers, flashings and parting lines must be ground off prior to assembly. The abrasive belts in use—a standard glue-bonded type—were proving unsatisfactory: low production volume, excessive down time were keeping costs high.

After analysis of the operation, the 3M Representative suggested the use of tough, resin-construction "Three-M-ite" Resinbond belts, with a specific belt lubricant.

Now this difficult grinding job is done faster and better. National Aluminum reports a 50% increase in the number of units ground and a corresponding decrease in abrasive costs!

Why not let 3M's new COST CHECK 5-4-5 Program help you to effectively investigate ways to lower costs and increase production. Discover:

- If your grinding can be done more economically
- If your finishing is as efficient as possible
- If your polishing can be done faster and better

Send today for a free COST CHECK 5-4-5 Review Form *without obligation.* Put 3M's years of abrasive know-how at your disposal.

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Circle 600 on Page 55

EXECUTIVE REPORT #19

TOUGH CLEANING JOBS

call for the mighty SUPER TUMBLAST

With tireless cleaning power and super performance features, the Wheelabrator Super Tumblast gives you the ultimate in cleaning efficiency and production capacity. It's engineered throughout as a *heavy duty* batch type airless blast mill, to handle the rough and tough cleaning jobs, clean efficiently, save abrasive, give maximum parts wear, and go easy on maintenance costs.

Super Tumblast performance is proven in nearly 200 successful installations

The Super Tumblast has demonstrated its ability to handle the really tough cleaning jobs, deliver high production, superior cleaning results, exceptional labor savings and unequalled economy. Get all the facts from Wheelabrator Corporation, 505 S. Byrkit St., Mishawaka, Ind. In Canada, P.O. Box 490, Scarborough, Ont.

Circle 601 on Page 55

tric motor provides power for 360-degree rotation which is controlled by an electro-magnetic disc brake. Company's line of hoists fits the crane, but other hoists with standard trolley mounting can be used.—**R. G. LeTourneau Inc.**, 2399 South MacArthur, Longview, Tex.

For More Details Circle No. 468—Page 55

DIFFERENTIAL HOIST

Differential hoist is available in 1000 and 2000-lb models. Features include needle bearings in the lower sheave, roller bearings in the upper set, aluminum alloy yokes, and electric welded chain zinc plated for protection against rusting.—**Thern Machine Co.**, Winona, Minn.

For More Details Circle No. 469—Page 55

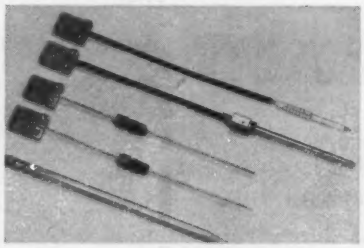
METALLIC LUBRICANT

Metallic lubricant provides dry film lubrication in applications where wet lubrication is impossible due to contamination by dust and dirt. No. 369 dry lubricant is said to be impervious to water, detergents, and most chemicals and will operate in very cold conditions or temperatures up to 1800° F.—**Imperial Oil & Grease Co.**, 6505 Wilshire Blvd., Los Angeles 48, Calif.

For More Details Circle No. 470—Page 55

THERMOCOUPLE

Miniature thermocouple is available in four models with temperature ranges from 0 to 2000° F. Unit provides temperature measurement of gases, liquids, and semi-solids



with fast response. Welded junction is claimed to facilitate use and insure reliability. Chromel alumel, iron constantan, and copper constantan types are available.—**Harco Laboratories**, Dept. TT, 77 Olive St., New Haven, Conn.

For More Details Circle No. 471—Page 55

TRUCK TIRES

Virgin rubber-nylon tires for off-the-road use on fork trucks, front dumpers, cranes, and similar equipment are designed to replace pneumatic and laminated tires. Only two light, flexible wire bands are used for reinforcement of these solid tires. Claimed to be puncture, cut, and abrasion-proof, the tires are available in all popular pneumatic sizes.—**Bearcat Tire Co.**, 442 W. Garfield Blvd., Chicago 9, Ill.

For More Details Circle No. 472—Page 55

RETRACTING REEL

Automatically retracting balance reel is said to keep within arm's reach unwieldy air hose tools, paint sprayer equipment, and portable electric tools. Model 700 BR has an Underwriters' approved grounding type electric reel assembly which eliminates need for a separate wire cable from which to suspend electrical tools. Model 700 CR is suitable for suspending electrical and non-electrical devices by a wire cable. Cable tension of both models is adjustable from 0 to 9 lb to

compensate for the weight of the tool. Features include an automatic clutch incorporated in the tension control, heavy-duty spring motor, oil-less bearings, steel housing, and wall or ceiling mounting.—**Cordomatic**, 17th & Indiana Ave., Philadelphia 32, Pa.

For More Details Circle No. 473—Page 55

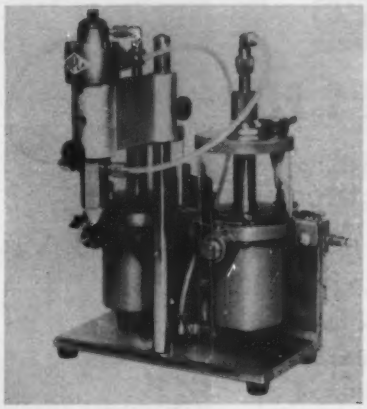
LIMIT SWITCH

Limit switch for electric hoists cuts off power automatically when the hoist is overloaded and prevents excessive cable unwinding when spotting blind loads. Unit is activated by an overload of between 5 and 10 lb and is claimed to reduce maintenance by eliminating excessive wear and strain plus preventing misuse by the operator.—**Shepard Niles Crane & Hoist Corp.**, Montour Falls, N. Y.

For More Details Circle No. 474—Page 55

AUTOMATIC DISPENSER

New high-speed machine for metering, mixing, and dispensing two component plastic systems utilizes pneumatic, hydraulic, electrical, and mechanical principles to operate automatically. The machine reportedly assures uniform volume and hardening, strength of dispensed two component systems, and elimination of waste in hand mixing. It can be adjusted to a wide range of cycles and materials and is designed to be used manually or adapted to automatic or semi-automatic production lines as a stationary piece of equipment.—**New Plastic Corp.**, 1026 N. Sycamore Ave., Los Angeles 38, Calif.



For More Details Circle No. 475—Page 55

CEMENT

Pourable cement is an anchoring compound said to have no shrinkage while setting. Material is composed of a finely divided powder plus additives which are claimed to control expansion and resist water erosion. It can be used for positioning and setting anchor bolts, fastening pipe flanges, hand rails, partitions, conveyors, and furnaces. Cement is odorless, vibration resistant, and self-leveling and is claimed to bond quickly to existing materials.—**Monroe Co.**, 10703 Quebec Ave., Cleveland 6, Ohio

For More Details Circle No. 476—Page 55

PROTECTIVE BOOTS

Accordion boots of neoprene base material incorporate metal locking plates and flanges to join together differently sized and shaped boot sections. Metal connector sections are cut round, square, oblong, or irregular to accommodate shapes and contours of the pliable sections. Tie-straps, grommets, and guide rods are said to allow the boots to be mounted in horizontal, angular,

EXECUTIVE REPORT #20

CASTINGS SERVED "WELL DONE"

On Wheelabrator® Swing Table®

Dodge Manufacturing Corp. of Mishawaka, Indiana, turned a production problem into profit by replacing outgrown airblast equipment with a Wheelabrator 96" Swing Table. The production power of this versatile blast cleaning cabinet cut labor requirements one third, and entirely eliminated overtime. Easy overhead loading and unloading speeds production, makes work handling highly efficient. The giant table takes mixed loads up to 10,000 lbs., and serves up cleaning quality far superior to anything previously obtained.

SWING TABLE OPTIONS COMPOUND ITS VERSATILITY

Wheelabrator Swing Tables can be equipped with double work doors, loading vestibules, spotblasting facilities, and other versatile features. For details, see your Wheelabrator engineer or write to Wheelabrator Corp., 505 S. Byrkit St., Mishawaka, Ind. In Canada, P. O. Box 490, Scarborough, Ont.

EXECUTIVE REPORT #23

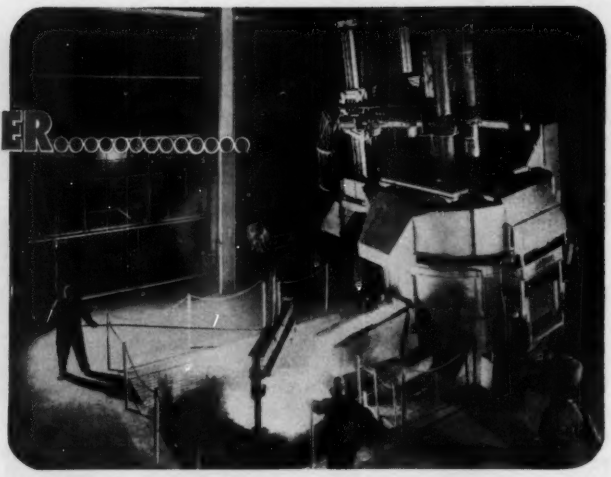
THE FOUNDRYMAN'S FILTER

Wheelabrator® Dustube® Collectors trap electric furnace dust and fume

Foundrymen who are concerned with costs rely on Wheelabrator Dustube Collectors to meet their local air pollution codes, and provide clean, dust-free air in the foundry, at the most favorable balance of cost to collection efficiency.

With a Wheelabrator electric furnace ventilation system, a discharge free of visible solids is insured. This hood and exhaust system will not restrict furnace operation and maintenance, nor affect metallurgy. Easy furnace roof replacement, maximum furnace roof life, minimum hood maintenance are assured.

Wheelabrator Dustube Collectors are in use today in 44 foundries, on some 64 electric furnaces . . . your assurance of complete furnace fume control.



WHEELABRATOR EXPERIENCE IS AT YOUR SERVICE

This knowledge of electric furnace fume control is at your disposal. Call your local Wheelabrator Dust and Fume Engineer. Or, write to WHEELABRATOR CORP., 505 S. Byrkit St., Mishawaka, Ind. In Canada, P. O. Box 490, Scarborough, Ont.

WHEELABRATOR
DUST AND FUME CONTROL

Circle 603 on Page 55

or vertical positions. Boots protect hydraulic rams, machinery ways, universal joints, packings, and seals against dust, cinders, grit, and moisture in temperature ranges from −80 to 500° F.—**A & A Mfg. Co.**, 712 S. 12th St., Milwaukee 4, Wis.

For More Details Circle No. 477—Page 55

STEEL PALLET

Pallet is offered in welded steel model. It is reinforced by center braces for heavy duty work and has four-way entrances for fork trucks. Standard sizes are in both single and double-face design, 48 x 40 in. and 48 x 48 in.—**Palmer-Shile Co.**, 16033 Fullerton, Detroit 27, Mich.

For More Details Circle No. 478—Page 55

SANDING DISC

Red Coat resin fiber disc features strong center mounting hole to prevent scratch patterns caused when the center hole breaks down. It is available in sizes ranging from 5 to 9⅛ in. in diam with center holes of ½ and ⅞ in. Aluminum oxide is used in grit sizes from 150 to coarser with full or spaced coating optional in 36 grit and coarser.—**Michigan Abrasive Co.**, 11900 E. Eight Mile Road, Detroit 5, Mich.

For More Details Circle No. 479—Page 55

EXHAUST UNIT

Flex Air Mover is a device to exhaust welding fumes and smoke from closed work areas. It consists of a special intake nozzle joined to a jet pump casting by a length of

flexible tubing. Smoke is exhausted through another connecting section of tubing to any discharge point. It is powered entirely by compressed air, and additional lengths of tubing may be added with no reduction in velocity or volume of smoke removed.—**Arcair Co.**, P. O. Box 431, Lancaster, Ohio.

For More Details Circle No. 480—Page 55

DRAIN TRAP

Drain trap automatically discharges condensate and oil as it is collected in compressed air lines. A large size orifice permits a discharge rate of 60 gph, and a blow-off valve is provided for periodic removal of accumulated rust and residue. The trap body and bowl are aluminum and the valve mechanism is stainless steel and brass. A single lock-ring can be unscrewed by hand to disassemble the trap. Dimensions include a height of 7 in., an overall diameter of 4⅝ in., and a total weight of 2 lb.—**Perfecting Service Co.**, 332 Atando Avenue, Charlotte 6, N. C.

For More Details Circle No. 481—Page 55

REVERSAL PRINT FILM

Ektachrome reversal print film makes it possible to view color projection prints of footage shot on color reversal film within hours of shooting. Print material is processed through the same equipment and chemicals used in developing camera films to cut down on process time and equipment. Excellent

color quality and definition are claimed for the print film. Type 7386 is for use with 16 mm film and Type 5386 is for 35 mm.—**Eastman Kodak Co.**, Rochester 4, N. Y.

For More Details Circle No. 482—Page 55

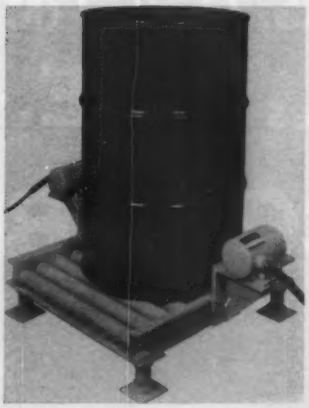
MORTAR

Franset mortar contains ingredients said to transmit plasticity to the mortar, resulting in easier trowelling, adhesion, and workability without settling or remixing. It is reported to contain less than 1 per cent iron and therefore to offer greater resistance to carbon and reducing atmospheres. It gives a strong bond without joint shrinkage.—**J. H. France Refractories Co.**, Snow Shoe, Pa.

For More Details Circle No. 483—Page 55

VIBRATING PLATFORM

Line of electric vibrating platforms, which can be installed in roller conveyor systems, is available to settle castings in containers before heat treating. Vibrator units on each side of the platform provide



settling action. Because they operate on a rotating eccentric weight principle, belts and pulleys are eliminated, and impact intensity can be changed by adjusting the position of the weights on the motor shaft. Four coil springs isolate vibration from surrounding structures. Vibrating roller platform is 24 in. square. Three-phase alternating current powers units in a choice of voltages from 110 to 550 v.—**Cleveland Vibrator Co.**, 2828 Clinton Ave., Cleveland 13, Ohio.

For More Details Circle No. 484—Page 55

CYLINDERS

Square-end, double-acting pneumatic and hydraulic cylinders feature a floating, two-stage cushion claimed to assure smooth deceleration of the piston with a cushioning effect fully adjustable from slight to complete stoppage. Interchangeable cylinders come in bore sizes of 1½ to 6 in. Temperature range is up to 212° F for the air model and 240° F for the oil model. Cylinders also are available for use with water.—**Mead Specialties Co.**, Dept. SH-8, 4114 North Knox Ave., Chicago 41, Ill.

For More Details Circle No. 485—Page 55

LUBRICANT

Lubricant known as Surf-Kote L-1020 is available for use in high-temperature, high-pressure applications. Noninflammable material contains a modified molybdenum disulfide compound and other additives suspended in a synthetic base vehicle. When the vehicle evaporates, a durable dry film of solid lubricating compound is left on most metal surfaces, preventing galling,

EXECUTIVE REPORT #28

RING PLANT WRINGS OUT MORE PRODUCTION

with Super Tumblast®

With a 14 cu. ft. Wheelabrator® Super Tumblast, Muskegon Piston Ring Co. of Sparta, Michigan, has increased cleaning room output to meet increased production.

The Super Tumblast, installed late in 1959, has averaged 150 tons of production per week, cleaning a wide variety of gray iron castings. Throwing 100% more abrasive per minute than the blast equipment previously used, the Super Tumblast cleans 800-lb. mixed loads, producing superior finishes in blast cycles of only 5½ minutes.

Maintenance through months of continuous service has been negligible. Only routine lubrication, inspection and adjustments have been required. Blade life of over 400 wheel-hours per set is a result of the high efficiency of the new CFS Separator.

IT PAYS TO REPLACE INADEQUATE EQUIPMENT

Your Wheelabrator engineer will help you analyze impartially the economics of replacing obsolete blast equipment with the unsurpassed production power of a Super Tumblast. Without obligation, write to Wheelabrator Corp., 505 S. Byrkit Street, Mishawaka, Indiana. In Canada, P. O. Box 490, Scarborough, Ontario.

WHEELABRATOR
AIRLESS BLAST EQUIPMENT

JENKINS BROTHERS, *Limited* (MONTREAL PLANT)

produces shell cores on F. E.*'s fully automatic*

SHELL CORE BLOWER

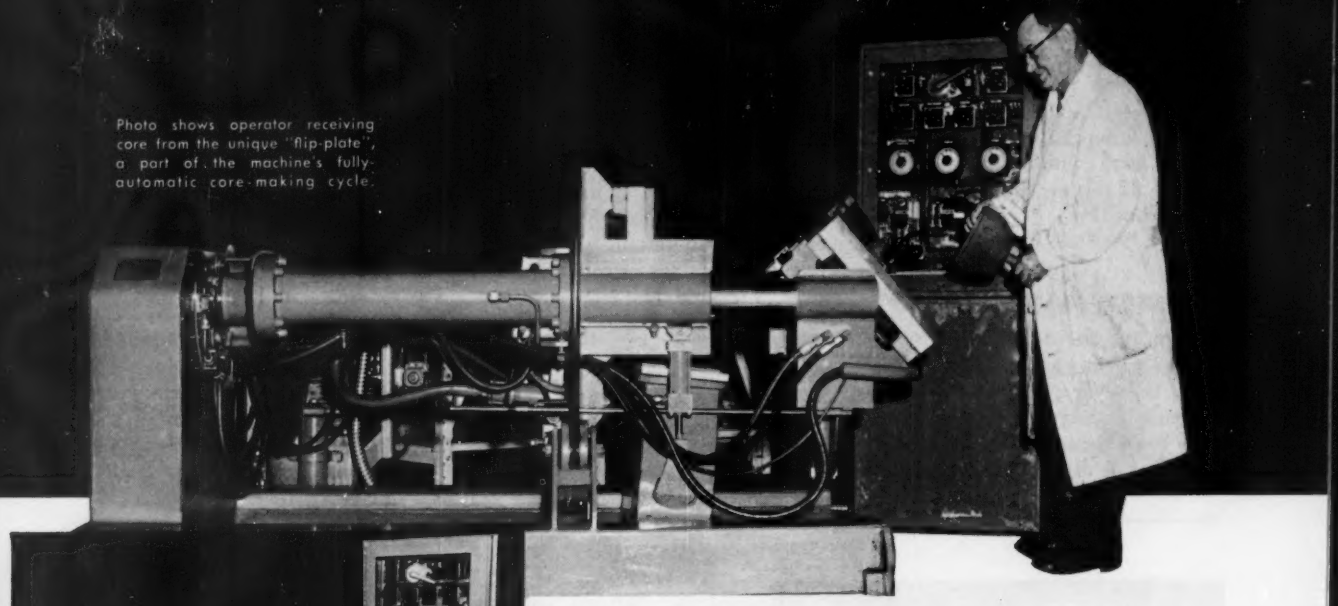


Photo shows operator receiving core from the unique "flip-plate", a part of the machine's fully-automatic core-making cycle.

F. E.'s new, streamlined Shell Core Blower uses two standard size, interchangeable heater plates — 20″x16″ for core box sizes up to 20″x17″x14″, and 20″x24″ for boxes to 20″x25″x14″.

All movements hydraulically controlled. Hydraulic unit and electric control panel self-contained, placed for convenience. Cores are ejected by means of a "flip-plate" assembly, which virtually "hands" cores to the operator. At no time does the operator have his hands between the heater plates.

F. E.'s Shell Core Blower is fast, efficient and very easy to operate. Turns out perfect shell cores — no core breakage, no core box wear. Quickly changed from fully-automatic to single cycle control. Easily set up and economical to operate.

Additional information and prices on request.

HEATER PLATES: Plug-in receptacle for easy change-over. Thermostat-control. Heavy-duty, cast-in elements.

HYDRAULIC CYLINDERS: Have case-hardened, chrome-plated rods.

POWER CONSUMPTION: 20″x16″ heater plate, 16½ KW — 20″x24″ plate, 24 KW.

AIR PRESSURE: 80-100 p.s.i. Regulator, filter, lubricator supplied.

CONTROL PANEL: Standard equipment — investment, cure, rocking timers.

SAND BOX: Adjustable to suit core box parting line. Can be supplied with automatic refill unit.

OVER-ALL BLOWER DIMENSIONS: Length 80″, width 52″, height 50″.

F. E. NORTH AMERICA, LTD.

47 ADVANCE ROAD, TORONTO 18, ONTARIO, CANADA

TELEPHONE: BELMONT 3-3227 • **TELEGRAMS:** EQUIPMENT, TORONTO

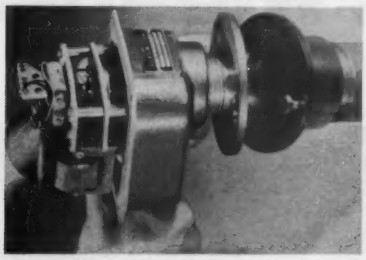
Circle 605 on Page 55

seizing, fretting corrosion, cold welding, and similar friction problems at temperatures up to 750° F. It can be applied directly to load-bearing surfaces by brush or through grease cups and zerk fittings. **Hohman Plating & Mfg. Co.**, 814 Vermont Ave., Dayton 4, Ohio.

For More Details Circle No. 486—Page 55

FLAME DETECTOR

Flame detector senses presence of flame and operates a relay to provide an alarm signal in the event of flame failure. The unit is de-

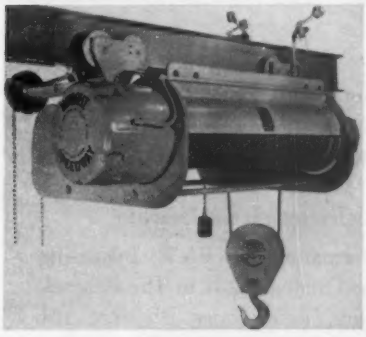


signed to monitor burners in gas, oil, coal, or combination fuel-fired furnaces. It responds only to the flame under surveillance and not to adjacent flames or infrared radiation from glowing refractories. Detector-sensing element withstands temperature up to 600° F and can be mounted remotely from the detector case. Relay contact rating is 2 amp at 125 v ac or 2 amp at 25 v dc.—**Bailey Meter Co.**, 1050 Ivanhoe Rd., Cleveland 10, Ohio.

For More Details Circle No. 487—Page 55

ELECTRIC HOIST

Electric hoist has lifting capacity of 12,000 lb to a height of 115 ft at a speed of 20 fpm. The geared-trolley hoist is offset so that it can ne-



gotiate 7-ft radius curves. Features include an expanding jaw-type motor brake and a fully-enclosed, 7.5-hp motor built for 220 or 440 v, 60-cycle, 3-phase operation. Motors of single, two, or variable speeds can be furnished.—**Wright Hoist Div., American Chain & Cable Co.**, York, Pa.

For More Details Circle No. 488—Page 55

DUST COLLECTOR

Wet type dust collector is claimed to remove dirt, dust, grindings, chips, fumes, and vapors while requiring a minimum of floor space. Contaminants are washed, scrubbed, and fogged out of the air stream and deposited as a wet sludge for manual or automatic removal. Several models are available to fit most applications.—**Devilbiss Co.**, 300 Philips Ave., Toledo 1, Ohio.

For More Details Circle No. 489—Page 55

INSPIRATOR BURNERS

Inspirator burners in redesigned line are suited for applications in plants where high pressure gas is used, as in core ovens and annealing and heat treating furnaces. The burner mixes atmospheric air with the fuel and has a range from 20,-

000 Btu minimum to 1½ million Btu maximum. Only attachment necessary is a gas line. The burner is a nozzle-mixing high pressure burner with pulsation-type combustion. The flame produced is instant, to full heat, and burns with a pulsating action.—**E. W. Bliss Co.**, Canton, Ohio.

For More Details Circle No. 490—Page 55

CHROMIUM ALLOYS

Two new chromium alloys are ferrochrome-silicon and low-carbon blocking chrome. Ferrochrome-silicon is used in production of stainless steels for chromium additions and for reducing metal oxides from the slag back into the bath. It is composed of 43-46 per cent chromium, 37.5-39.5 per cent silicon, and 0.15 per cent max carbon. Low-carbon blocking chrome is used for open-hearth furnace additions in production of low-alloy steels. It contains 56-59 per cent chromium, 18-20 per cent silicon, and 2 per cent max carbon.—**Union Carbide Metals Co.**, a division of Union Carbide Corp., 270 Park Ave., New York 17, N. Y.

For More Details Circle No. 491—Page 55

CO_2 UNIT

Liquiflow Portable unit maintains CO_2 at 300 psig, 0° F., by a self-contained refrigeration unit which operates on standard 110-v current. Unit has a 1000-lb capacity and

can supply either low pressure liquid CO_2 or CO_2 vapor. It is available for use in plants to eliminate extensive piping or multiple fixed installations.—**Liquid Carbonic Div., General Dynamics Corp.**, 135 S. LaSalle St., Chicago 3, Ill.

For More Details Circle No. 492—Page 55

SAFETY SPECTACLES

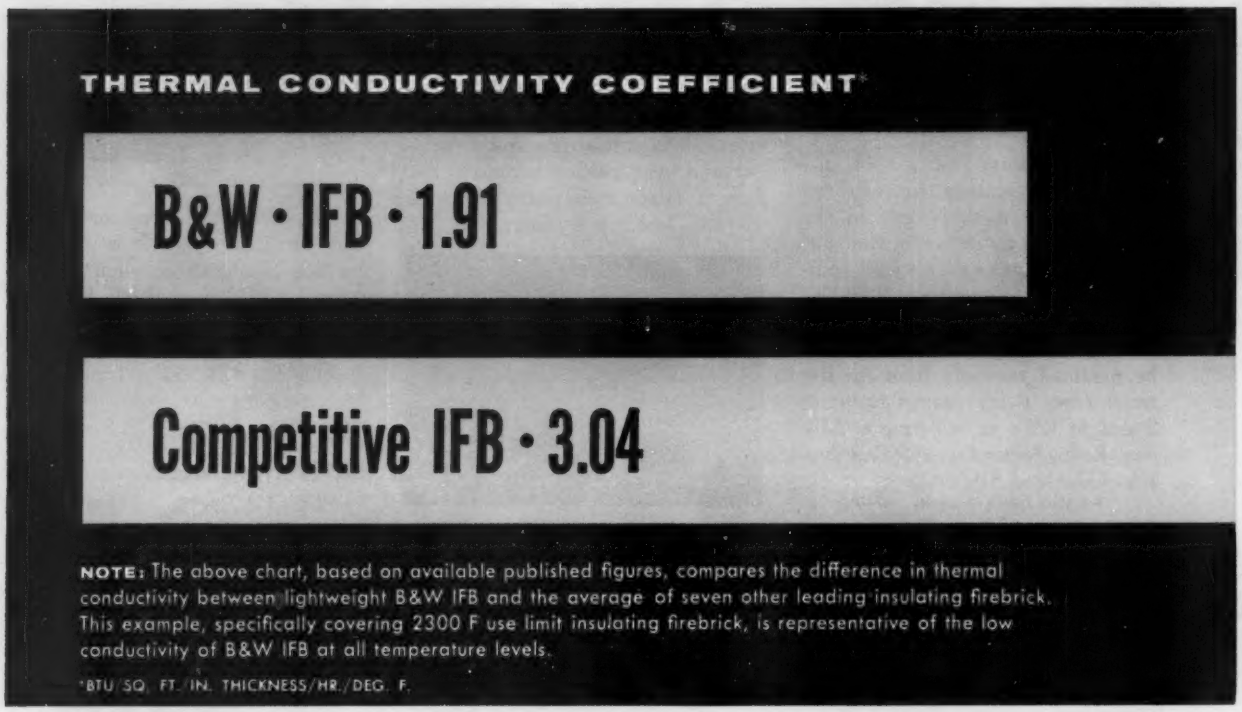
All-plastic spectacle offers inexpensive eye protection for visitors to industrial plants. They provide coverage through a single lens

which covers both eyes. Lenses are available in either clear or green in a clear crystal frame and are packaged individually.—**American Optical Co.**, Southbridge, Mass.

For More Details Circle No. 493—Page 55

Another *plus* of Lightweight B&W Insulating Firebrick

LOWER THERMAL CONDUCTIVITY means



NOTE: The above chart, based on available published figures, compares the difference in thermal conductivity between lightweight B&W IFB and the average of seven other leading insulating firebrick. This example, specifically covering 2300 F use limit insulating firebrick, is representative of the low conductivity of B&W IFB at all temperature levels.

*BTU/SQ. FT./IN. THICKNESS/HR./DEG. F.

All insulating firebrick are not the same. Published figures show wide variations in *all* of the important properties among the leading brands of IFB.

Take thermal conductivity. This important property affects fuel costs, temperature control and the speed with which a furnace heats and cools. Thermal conductivities range from a B&W low of 1.91 to a high of 3.47 for a competitive IFB—*almost a 100% difference in wasted heat and fuel costs.*

You are paying for insulating firebrick . . . make sure you get *all* the benefits. B&W—the originator of IFB—manufactures a full line of IFB with an experience-proved balance of light weight, high insulating value, high strength and long life.

For complete information on B&W Insulating Firebrick, write for Catalog R-2-H to The Babcock & Wilcox Company, Refractories Division, 161 East 42nd Street, New York 17, N. Y.

NUMBER 1 OF A SERIES

LOWER FUEL COSTS

the payoff

- 14% lower fuel costs • 30 F lower casing temperature
- 25% less time to reach operating temperature • 12 hours saved per cycle

These are the results of a direct comparison of two furnaces of the type shown above, one lined with B&W IFB and the other with one of the better competitive insulating firebrick. That's how B&W pays off for a major steel company in their 8-stack, hood type, strip annealing furnaces. This is just one of many proofs in our files that "there is an important difference in insulating firebrick."

B&W

R-638

THE BABCOCK & WILCOX COMPANY

REFRACTORIES DIVISION

Circle 606 on Page 55

Foundry Developments

By EDWIN BREMER

Metallurgical Editor

Resists Wear

URETHANE rubber wear plates installed in the elbows of a pneumatic system handling hot core sand at the Elizabeth Street Foundry Co., Chicago, are reported to have withstood the passage of 840,000 lb of sand at a temperature of 175° F during a period of 6 months before wearing through. Mild steel wear plates lasted about a month and abrasion resistant alloy steel wear plates stood up for two months.

The rubber, called Adiprene, was developed by the Du Pont Co., and is said to have a remarkable combination of hardness, resilience, and load bearing capacity as well as excellent resistance to abrasion, oxygen, ozone, oils, and grease. Wear-resistant products of the rubber are made by Dike-O-Seal Inc., Chicago.

Acts Like Liquid

CONCEPT of heating parts in a dense dispersion of hot, highly turbulent solid particles suspended in a controlled stream of atmosphere has been developed by General Electric engineers. Called the fluidized bed process, the atmosphere may be air or any controlled medium.

The fluidized solid particles have virtually the same physical and thermal properties of a true liquid, but are inert and will not wet, abrade or otherwise affect equipment or the work. Process can be used for heating or quenching.

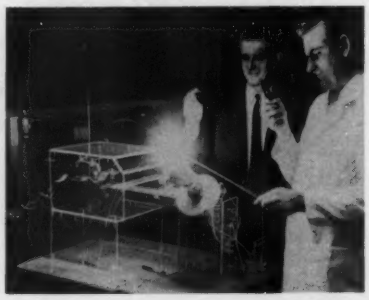
Permanent Molding

LOW-PRESSURE casting process used for producing aluminum cylinder heads for Chevrolet's Corvair engine is being licensed in this country and Canada through Ladd & Little Inc., Huntington Station, N. Y. Developed by Karl Schmidt GmbH, Metallgesellschaft AG, the process employs permanent molds which are mounted on the tops of electric induction holding furnaces.

Molten metal is forced from the furnaces up into the mold cavities by air pressure of about 10 psi. The process is claimed to provide castings with a high-density structure and a high yield due to a small gating system. Automatic operation permits one operator to service three machines. Initial costs are said to be about the same as for permanent molding. The sealed furnace and under-surface injection of molten metal into the mold promote production of clean castings. Cores of dry sand, plaster, or resin-bonded sand can be used with the process.

Heat Without Fuel

DEVICE that generates extremely high temperatures without consuming any fuel has been built by Amperex Electronic Corp., Hicksville, L. I., N. Y. Called the plasma torch,



the unit operates by using the energy of a high-frequency electromagnetic field to ionize gas molecules into their component atoms and then allowing them to recombine into their original state. During the recombination the absorbed energy is liberated in the form of heat.

It is reported that the torch is small enough to be mobile, simple in design and easy to construct. Prototype cost is said to be less than $1000. One unit uses an Amperex type 5866 standard transmitting tube, and another a type 7292 magnetron.

Changes Cast Structure

ACCORDING to an article in the September issue of *Metallurgia* (Manchester, England), it is possible to change the cast structure of high-speed (W-Cr-V) tool steels by breaking up the carbide or eutectic into small globules. Termed prespheroidizing, the technique is to reheat the as-cast steel to the reaction temperature (about 1320° C) at which the eutectic actually becomes molten. The steel then is in the same state as it was just before the ingot froze, and by holding it at this temperature, reaction takes place between the liquid and solid to give a new solid phase without eutectic.

The process as yet is not a commercial proposition for ingot material, but it might be used for investment-cast high-speed tools. Those pieces are small so that temperature control is easier and handling simpler. Prespheroidizing temperature is only about 30° C (86° F) above the normal hardening temperature for the steels.

New Length Standard

REPLACING the platinum-iridium meter bar which has served as the standard of length for over 70 years is a new international standard of length—a wavelength of light. New definition of the meter is 1,650,763.73 wavelengths of the orange-red line of krypton 86, and the inch now becomes equal to 41,929.399 wavelengths of the krypton light.

Action for the change was taken at the 11th General Conference on Weights and Measures which was held in Paris Oct. 10 to 15. The meter bar still will be used for certain types of measurement.

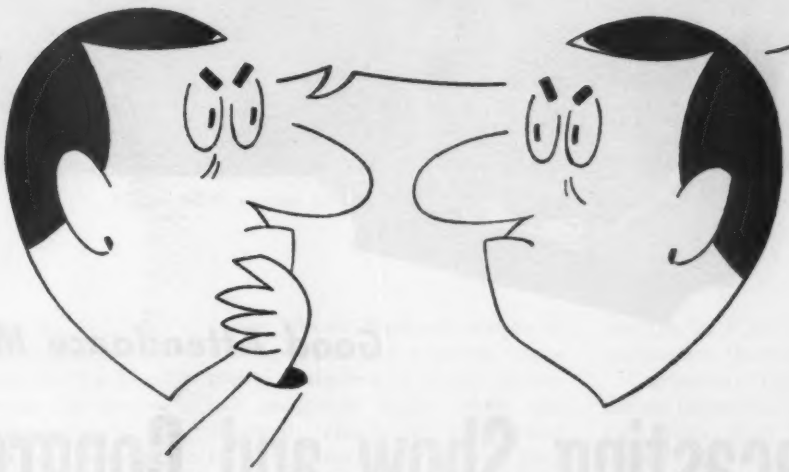
Measures Flaw Size

PROCESS for determining the actual flaw size in metals and other materials by ultrasonic means is described in a research report available through the Office of Technical Services, U. S. Department of Commerce, Washington 25. It is entitled "Investigation of Methods for Determining Actual Flaw Size in Materials by Nondestructive Ultrasonic Techniques," and is designated PB 161530. Price is $1.75.

Mr. Core Man:

ASK YOURSELF THIS QUESTION . . .

ARE WE GETTING EVERYTHING WE NEED FROM OUR CORE OILS?



It doesn't happen every day in the week, but every now and then we get a call for help. Some core man asks himself the above question, gets a negative answer, decides to investigate and calls us for our recommendations.

Again, it doesn't happen every time, but we can truthfully say that, in most cases, we've been able to improve performance and effect a savings.

We've been in this core oil business now for many, many years and know the answers to core oil problems. For the same length of time, we've been making the finest quality oils — and selling them, you'll be glad to learn, at surprisingly low prices.

So, whenever you're in the mood to question the efficiency and economy of your present core oils — please remember that W·G·S has helped others and just might be able to help *you,* too!

WERNER G. SMITH, INC.

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"WERSMITH" CORE OILS COST LESS TO BUY...COST LESS TO USE

Circle 607 on Page 55

Joseph G. Rayniak, right, Outboard Marine Corp., receives the SDCE Achievement Award plaque, shown below, from Ollie J. Clayton, SDCE president

Good Attendance Marks

Diecasting Show and Congress

More than 80 exhibitors and 31 technical papers combine to produce successful National Die Casting Exposition and Congress, held Nov. 8-11 in Detroit by the Society of Die Casting Engineers

● REACTIONS of both exhibitors and visitors to the first National Die Casting Exposition & Congress affirm the success of the event, the first of its kind in this country. It was held Nov. 8-11 at the Detroit Artillery Armory, Detroit, under sponsorship of the Society of Die Casting Engineers.

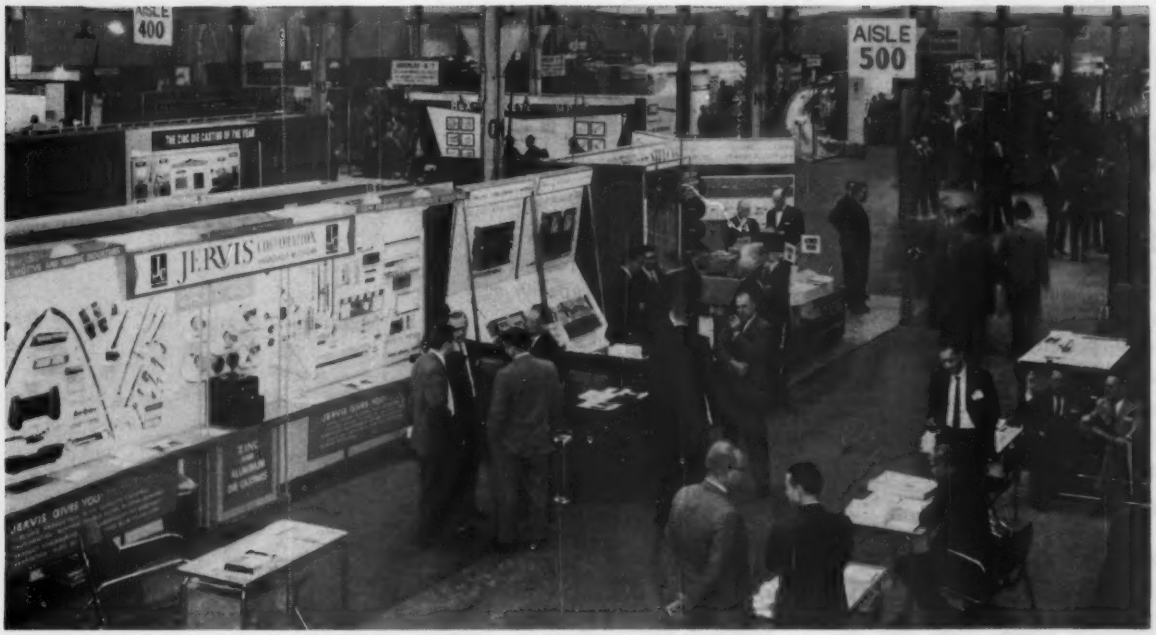
Approximately 4000 persons attended the exposition, at which more than 80 exhibitors displayed a range of diecasting equipment, supplies, and processes which included diecasting machines and dies, trim equipment, metals, lubricants, casting and anodizing methods, etc.

Technical Program Broad—In addition, more than 500 persons registered for the technical congress, which was held in morning and afternoon sessions each day of the conference. These sessions included 31 papers grouped in such general subject areas as die design, die building, metallurgical developments, what lies ahead in diecasting, competition to diecasting, cost and profit, quality control, and vacuum in diecasting.

Visitors also included nearly 200 diecasters from abroad. Among them were large teams from Japan and England as well as many individuals from Germany, Italy, Latin America, and various other nations. Most of this group was considerably impressed by the scope and progress of American diecasting and by the exposition and congress itself.

Exposition Banquet—The exposition banquet was held Thursday evening, Nov. 10, at the Veterans Memorial Building in Detroit, and attracted nearly 500 people. Speaker at the banquet was Joseph G. Rayniak, vice chairman of the board and manufacturing research director, Outboard Marine Corp., Waukegan, Ill.

Mr. Rayniak stated that free exchange of technology will increase employment and raise living standards both in American and in for-



About 4000 visitors attended the exposition and saw more than 80 exhibits

eign nations. In addition, Mr. Rayniak said, such unrestrained trading of technological skills is the blueprint for strengthening the diecasting industry and opening avenues to new markets and new products.

Mr. Rayniak also was the recipient of the SDCE's first Achievement Award for outstanding contributions in the field of diecasting. He was presented a plaque recognizing his achievements by Ollie J. Clayton, SDCE president.

A veteran of half a century in metal fabrication and production, Mr. Rayniak is best known for his career at Johnson Motors, a division of Outboard Marine, where he spent 30 years before he became a corporation executive. At that company, he installed the first diecasting equipment to produce outboard motors. Today, the OMC plants include 119 diecasting machines and 147 furnaces through which 4 million lb of finished castings are processed monthly.

The Diecast Block—A feature of the exposition and congress was a special conference at which the diecast aluminum engine block was discussed. This subject was covered by A. F. Bauer, Doehler-Jarvis Div., National Lead Co., Toledo, and A. Triulzi, G. Triulzi S.A.S., Milan, Italy.

Mr. Bauer's division has produced 50,000 six-cylinder diecast aluminum blocks for American Motors Corp.'s 1961 Rambler Classic Six cars. Mr. Triulzi is manufacturing a 2500-ton capacity diecasting machine and the dies for 4 and 8-cylinder diecast engines for the Soviet Union.

Consensus of the panel is that the diecast engine block will continue to gain favor both in America and abroad. Development of these engines will differ in one major respect: American engines will incorporate dry liners, (cast into the blocks), whereas European engines will use wet liners.

Next month, FOUNDRY will present a complete resume of the papers presented at the technical sessions of the congress.

Left to right, A. Triulzi, G. Triulzi S.A.S., Milan, Italy, and A. F. Bauer and F. J. Koegler, Doehler-Jarvis Div., National Lead Co., Toledo, look over the original Kaiser diecast block (on left), which never was used, and the new Rambler diecast block, both produced by Doehler-Jarvis Div.

Industry Briefs

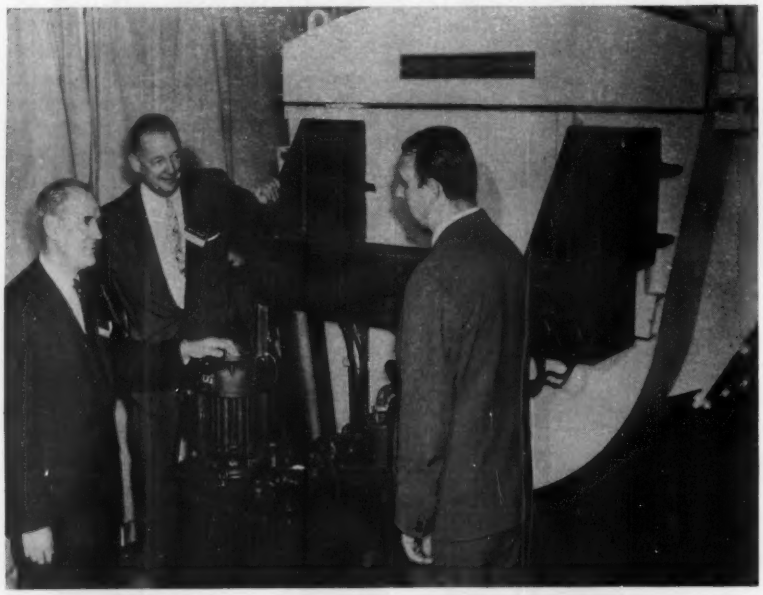
Abrasives Inc., Milwaukee, Wis., has been established to market foreign-made abrasive and cutting tools in the Midwest. The firm will sell the products of C. Lingspor Ltd., Haiger, Germany.

C. H. Hoppe Foundry Co. has sold its building at 424 W. 24th Place, Chicago, to the Blitz Body Corp., for $33,000.

Frederic B. Stevens Inc., Detroit, has moved its New England Division from New Haven, Conn., to Wallingford, Conn. The new installation, at 440 S. Colony St., Wallingford, has expanded the facilities of the company for the manufacture of buffing compositions, warehousing of supplies and equipment for foundry and metal finishing trades, and increased its capacity for lining plating and processing tanks of all types and sizes. Walter Lynch, regional manager in New Haven, will continue in this capacity at the Wallingford branch.

Stauffer-Temescal Co., Richmond, Calif., has changed its name to Stauffer Metals Co. The wholly owned subsidiary will become a division of the parent company, Stauffer Chemical Co., New York, next Jan. 1. It sells and licenses electron beam melting and casting furnaces.

Ernest A. Hund Co., 26 Von Zuben Court, Fort Thomas, Ky., has been appointed manufacturers' representative for Clearfield Machine Co., Clearfield, Pa.; Neff & Fry Silo Co., Camden, Ohio; and for southern Ohio only, Carrier Conveyor Corp. through Thomas Equipment Inc., Cincinnati. The firm covers southern Ohio, southern Indiana, and Kentucky.



ENLARGES FURNACE LINE: Low-frequency induction melting and holding furnaces have been added to its line of industrial heat processing equipment by Hevi-Duty Electric Co., Watertown, Wis. Furnaces will be manufactured and distributed by Hevi-Duty under a licensing agreement with Forni Elettrici A. Tagliaferri, Milan, Italy. In the photo, Franco Manzoni (right), Tagliaferri's chief design engineer, demonstrates a feature of a receiver's hydraulic tilting mechanism to Elton Staples, left, president of Hevi-Duty, and Tate Elliott, center, Hevi-Duty induction furnace applications engineer

Mathews Conveyer Co., Ellwood City, Pa., has purchased the Tobert Co., Lansing, Mich. All Tobert manufacturing operations will be moved to the Ellwood City plant immediately, and the units will be sold by Tobert's subsidiaries at San Carlos, Calif., and Port Hope, Ont., as well as by Mathews Conveyer.

American Railway Institute reports 4265 new freight cars delivered in September, compared with 4124 in August. September orders for new freight cars amounted to 2061, against 1343 in August. Backlog of cars on order and undelivered as of Oct. 1 was 21,662.

Imperial Brass Mfg. Co., Niles, Ill., and **Eastman Mfg. Co.**, Manitowoc, Wis., have merged with the approval of the stockholders of both companies. The merged company will be known as the Imperial-Eastman Corp.

WaiMet Alloys Co., Dearborn, Mich., has appointed Barker Foundry Supply Co., 4879 Fruitland, Los Angeles, its representative for the sale of stainless steel alloys, standard and high-temperature alloys, tool steel alloys, and special alloys.

Industrial Heating Equipment Association Inc., reports that new orders for industrial heating equipment in September totaled $5,253,000, down 33 per cent from August orders of $7,840,000. September orders for induction heating equipment were $627,000 or 40 per cent behind August.

Salescraft Associates, Cleveland, has been formed by Richard W. Devans and John Mihovk, formerly with Precision Metalsmiths Inc., Cleveland, to serve as manufacturers' representatives in Ohio and western Pennsylvania. The firm

"ROYERATED" SAND IS THE FINEST BLENDED AND AERATED SAND YOU'LL EVER SEE!

You're looking at the "business" end of a machine that for some 40 years has given foundrymen everywhere the best in blended and aerated sand. SAND SEPARATORS AND BLENDERS use a unique "combing belt" principle (we call *Royeration*) that combines combing of the sand with thorough churning, mixing and cooling. These machines—for any size foundry—available as portable or stationary, hand-shovel, tractor-bucket feeding or mechanized "in-line" installations. Capacities from 4 to 180 tons/hour. *New bulletin #SS-60 tells all.* Get all the specs, facts by contacting us. Royer Foundry & Machine Co., 159 Pringle Street, Kingston, Penna., phone BUtler 7-2165.

Circle 608 on Page 55

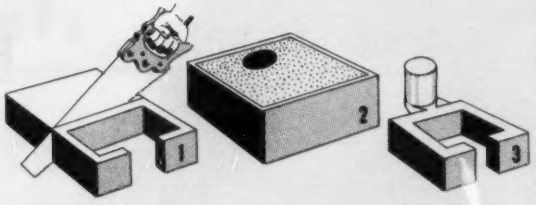
ROYER

ROYER FOUNDRY & MACHINE CO.

HOW To Do It

FOUNDRY will pay a minimum of $15 for each "How To Do It" idea submitted and published

Foamed Plastic Pattern Left in Mold Is Vaporized by Incoming Metal



By H. B. DIETER
D & H Foundry
Austin, Texas

ONE-OF-A-KIND castings for use in making jigs, fixtures, brackets, or other parts can be produced easily and quickly with very little pattern work. A block of foamed plastic is whittled or sawed to the shape desired and finished with sandpaper, Fig. 1. Normal casting shrinkage allowance must be included in the measurements.

The foamed plastic pattern then is placed in a suitable flask and molding sand rammed around it firmly by hand. Sprues and risers can be formed with the plastic or can be cut in the mold, Fig. 2. The mold should be vented adequately.

Molten metal poured into the mold vaporizes the plastic and replaces it, leaving a metal duplicate of the pattern, Fig. 3. The finished casting has a surface texture similar to that of a corn cob, but for many purposes the surface finish is unimportant. A smoother finish can be obtained by smoothing the surface of the pattern with a hot iron before ramming the mold.

will handle investment castings, aluminum forgings, wood and metal patterns, and production and specialty machining.

C & S Products Co., an affiliate of Barber-Green Co., Aurora, Ill., has announced a 3200-sq ft addition to its Detroit plant and offices. The new building provides additional space for the manufacture of foundry equipment and facilities for expanded engineering and accounting departments.

Pekay Machine & Engineering Co. has moved to a new plant at 2520 W. Lake St., Chicago. About 30 per cent more space is available at the new location.

Summerfield Brunk & Associates has been formed with headquarters in Evanston, Ill. The new firm will serve as management consultants to foundries.

Mechanex Corp., Englewood, Colo., has moved into a new plant at 3773 S. Jason St., Englewood. A metal casting foundry, a rubber plant, research and engineering offices, a production plant, and business offices will be in operation at this location.

AFS Sponsors 1961 Kennedy Memorial Apprentice Contest

The 1961 AFS Robert E. Kennedy Memorial Apprentice Contest officially opened Oct. 1. This contest is held to stimulate the development of individual skills and craftsmanship in patternmaking and the foundry trades and to increase interest in apprentice training.

Any apprentice, learner, or trainee in the metal castings industry having less than 5 years patternmaking experience or 4 years molding experience is eligible to enter. Entries from plants located in an AFS Chapter holding a local elimination contest must clear through the local contest. If no local contest is held, entries should be submitted direct for national judging.

In any one year, a contestant is permitted to compete in only one division of the Apprentice Contest. All entries to be considered for national judging in the 1961 contest must be received at the University of Illinois, Navy Pier, Chicago, not later than 5 p.m. Friday, March 31, 1961.

Each contestant must receive, prior to entering competition, a copy of the 1961 rules and regulations. Contestants will not be permitted to examine the pattern or blueprint prior to entering competition, and will not be informed of the nature of the pattern or blueprint. The contest has divisions: Gray iron molding, nonferrous molding, steel molding, metal patternmaking, and wood patternmaking.

Prizes will be $100 for first place, $75 for second place, and $50 for third place winners in each of the five divisions.

Philadelphia Chapter, AFS, Sponsors Foundry Course

The Philadelphia Chapter of the American Foundrymen's Society is sponsoring a foundry course in cooperation with Murrell Dobbins Technical High School. The course on foundry practice includes lectures on various foundry operations, shopwork, and visits to foundries. Classes which began November 14 are held on consecutive Mondays through December 5. No classes will be held during the holidays but they will resume on Tuesday, January 3, and continue on consecutive Mondays until March 20. Registration fee is $1. The course is open to AFS members and nonmembers and is being conducted in the foundry annex building at Lehigh Ave., at 22nd St., Philadelphia.

How to economize without a compromise...

PENOLYN 167 CORE OIL

Foundrymen know that when the castings they produce are costly, complex, and subject to rigid specifications...they shouldn't settle for anything less than Penolyn 167 Core Oil. Consistently used in some of the nation's leading foundries, Penolyn 167 has an outstanding history of reliability and is sure to make an expensive casting right when it really counts – *the first time.*

As a leading producer and nation-wide marketer of core oils for 30 years, Penola is quite proud of its position as a leader in the development of new, efficient, dependable core oils. For further information, contact your nearest Penola office or write: 15 West 51st Street, New York 19, N. Y.

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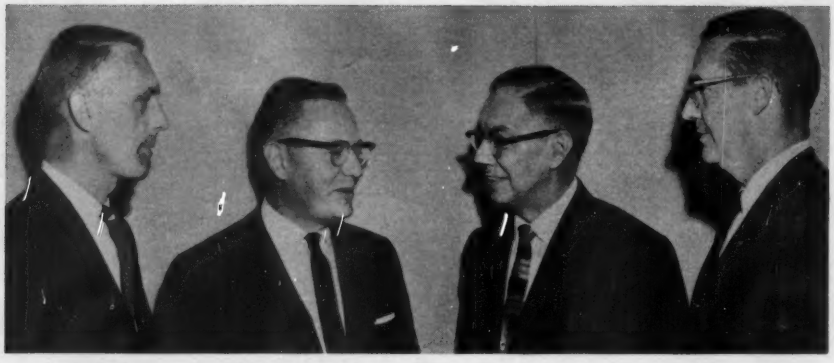

New GIFS officers, left to right, are Paul H. Scherf, treasurer; John E. McIntyre, president; Cecil Garland, vice president, and J. T. Boyd, secretary

Gray Iron Founders' Society

Steps Up Promotional Work

Increased gray iron castings consumption is aim of new educational film program and a proposed long-range advertising and public relations program. Details presented at society's 32nd annual meeting in Cincinnati

By WILLIAM G. GUDE
Editor

● STEPPED-UP efforts to promote the use of gray iron castings are planned by the Gray Iron Founders' Society.

Details of a new educational film program, already under way, and a long-range advertising and public relations program, now under consideration, were given to the society's members at the 32nd annual GIFS meeting in Cincinnati, Oct. 12-14.

These promotional efforts would supplement the successful program of sales and design clinics which is in its third year, the casting design service inaugurated early this year, and other market development activities of the Marketing Committee.

In addition, society president A. M. Nutter, E. L. LeBaron Foundry Co., Brockton, Mass., reported that the Committee on Merchant Pig Iron, American Iron & Steel Institute, has agreed to finance an intensive technical-economic

Officers and directors of the society at its 32nd annual meeting in Cincinnati

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This Hevi-Duty Oven bakes cores for sand casting brass bushings and gears at Bucyrus-Erie Company, South Milwaukee, Wisconsin. The finished parts will be used in the world's largest power shovel. This oven more than matches the output of the unit it replaced, yet it requires only half the floor space. Further, its temperature uniformity and efficient combustion assure clean cores of excellent quality. ***For complete information on this, write for Bulletin 259.***

Stainless Foundry and Engineering, Inc., Milwaukee, Wisconsin, uses this Hevi-Duty oven for drying molds and cores. It operates 24 hours a day, five days a week at 475° F. Its over-all temperature uniformity, excellent circulation of heated air has doubled capacity of the previous unit. Efficient combustion has also resulted in fuel savings, and contributed to the excellence of the finished castings. ***For complete information on this, write for Bulletin 259.***

A unique system of ducts above and below each belt distributes hot air evenly among these three tiers of paper mache flower pots. This oven also dries packaging materials for a large Midwestern container corporation. Built in standard 20-ft increments, it can be expanded to meet any continuous evaporation process by simply adding new sections. ***Please write for Bulletin 159.***

Circle 610 on Page 55

Newly elected directors of GIFS, left to right, are Robert F. Pohlman, James Crowley, Will H. Sanburn, and Paul W. Kluge

analysis of the industry's major consuming markets. The study, to be supervised by the society, is expected to have immediate beneficial effects, but its prime purpose is to point to the most urgently needed research and product development projects.

Clinics Popular—In his annual report, Mr. Nutter announced that, to date, the clinic program has attracted the following audiences: 312 men from 134 foundries at 14 three-day sales clinics for GIFS members; 99 men from 52 foundries at 7 two-day sales refresher clinics for members; and 901 customers from 453 companies at 29 one-day design clinics.

Mr. Nutter also referred briefly to work of the society's other committees, including the advertising, cost, ductile iron, technical, and safety groups. An outstanding achievement in safety work was the National Safety Council's award to the society for "above-average progress in accident prevention."

Members were given a premiere showing of the new GIFS film "Rice Bowls to Rockets." It is the first of a series of movies and stripfilms which is intended to answer the need of design engineers for more information on properties and applications of gray iron castings. Developed with the help of a $76,000 grant from the American Coke & Coal Chemicals Institute, the program is described in more detail on Page 180 of this issue.

Details of a proposed expansion in advertising and sales promotion work were given by the Advertising Committee chairman Peter R. Rentschler, Hamilton Foundry Inc., Hamilton, Ohio, and its advertising counsel, John A. Ashby, Ashby & Associates, Cleveland.

Major item under consideration is a national advertising campaign in six business magazines and publications of various engineering schools. Other moves considered are a public relations program and expansion in publication of design information.

What's Wrong — Some of the things wrong with the gray iron industry were brought into focus by several speakers. Discussing "Your Industry—Where Does It Go from Here?" James L. Wyatt and Harry Figgie of Booz, Allen & Hamilton listed the industry's problems as falling under the main headings of marketing, technology, and management.

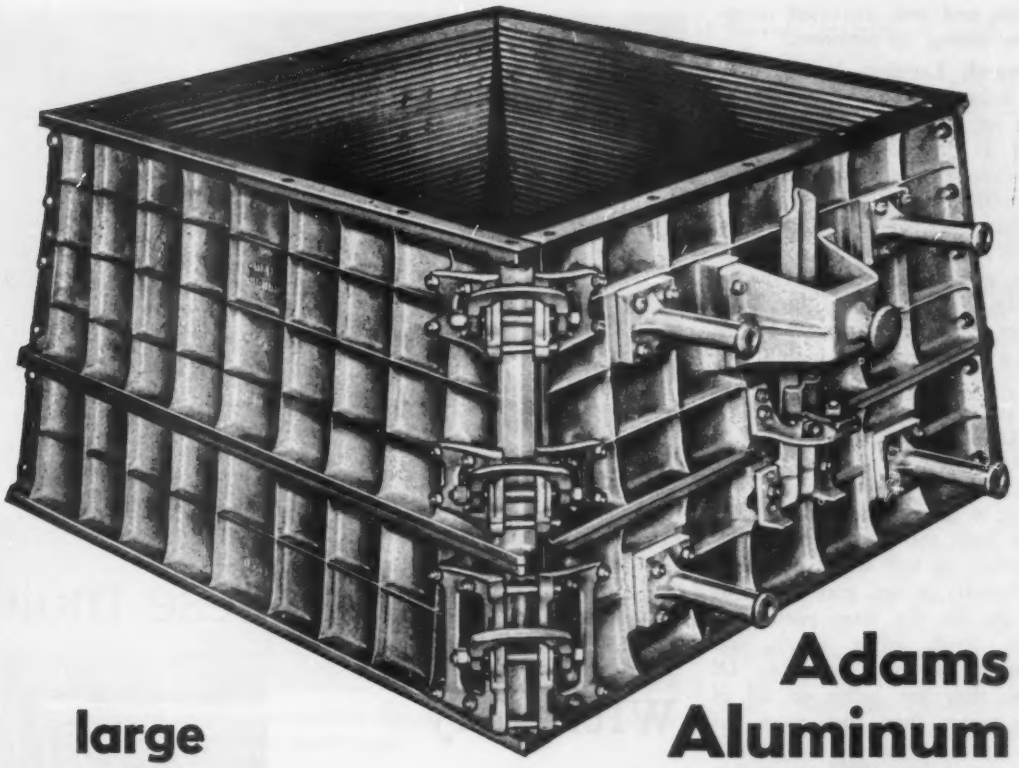
Marketing is the biggest problem and one that should be attacked on a co-operative basis. Foundries must be alert to the development of new products; it's imperative to get in on the ground floor—not after the manufacturer has definitely selected a competitive material for his product.

Gray iron technology is not so good. Quality too often is inferior. As one remedy, foundries should support the development of foundry engineers and technicians.

Management often is deficient in several respects. Outstanding faults are inadequate pricing practices, ineffective scrap control, toleration of inefficient methods, poor planning, and failure to delegate authority.

Neither production nor profits of gray iron foundries has kept pace with manufacturing as a whole in recent years. The industry's general aims should be to improve profits, diversify and expand its

Walter L. Seelbach, right, presents citations for outstanding contributions to the society and the industry to, left to right, J. T. Boyd, J. Edward Quest, and Albert M. Nutter. Charles R. Gregg was similarly honored



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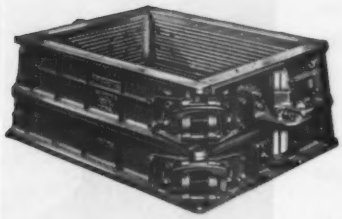

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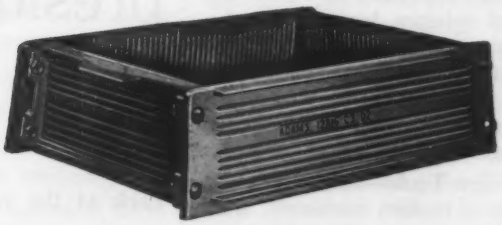

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markets, and seek increased co-operation among its members.

Research Lagging—If the gray iron industry spent relatively as much for research as does all industry in the United States, its 1960 expenditures would be about $60 million. Actually, it spends less than 0.03 per cent of its sales, against 2 per cent for all manufacturing, according to H. W. Lownie, Battelle Memorial Institute, Columbus, Ohio. He attributed to this neglect of research the inability of gray iron castings consumption to keep pace with the over-all industrial growth which has occurred in the last decade.

Mr. Lownie warned against continuing to ignore the characteristics which limit the gray iron market. "Whether we will admit it outside of a foundry or not, gray iron castings are for the most part overweight, weak, brittle, rough, and dimensionally inaccurate. Of course, they are better on all of these counts than they were ten years ago, but we are no longer competing with 1950's materials and 1950's prices.

"Today we are competing with 1960's myriad of new processes, new materials, and new prices. No company in any industry is likely to succeed in the future unless it gears its actions in 1960 to the conditions that will exist in 1970."

Sell What You've Got—Dr. G. Herbert True, Visual Research Inc., South Bend, Ind., offered several thought-provoking statements in a talk entitled "Let's Get Started." Although applicable to almost any type of industry, his comment that "practice can make permanent imperfections" and his urging to "sell what you've got" were particularly adapted to foundry operation and management.

Foreign Trade—Low wages plus the use of modern machinery, much of which was acquired from the United States, account for a large part of the disadvantage manufacturers in this country face in competition with foreign producers. This circumstance was cited by O. R. Strackbein, chairman, the Nation-wide Committee on Import-Export Policy, Washington. Although the Tariff Commission has the power to correct injury to U. S. industry, influence of the Department of State often has pre-

"Can't make these molds with any other resin," says foundry president

MUCH FASTER THAN PLASTER. In place of conventional plaster for vaned aluminum parts, foundrymen at Harris employ shell molds using Durez resin. They get molds in minutes instead of days.

Look at the vanes in this fluid-coupling part and you'll see why it is a tough one to cast in aluminum.

"Only one shell-mold resin—a Durez resin—gives us satisfactory release in this application," says George Harris, president of Harris Metals Treating Co., Racine, Wisconsin.

From days to minutes. In the vanes is where tolerances are smallest. This type of casting is generally made in plaster—a time-consuming operation.

To hold cost down, Harris foundrymen decided right from the start to use shell molds. Result: they're making molds in minutes instead of days—with accuracy and finish right up to par.

Why shell is good insurance. Customers like the savings they make on machining—with the smooth,

FOUNDRY WHIPS RELEASE PROBLEM. On these vaned aluminum castings, Harris Metals Treating Co. gets good results with a Durez shell-mold resin—the only one that works.

accurate castings that shell molding and coring make possible. Foundries everywhere are finding shell a powerful advantage in getting and holding business against competitive bids.

Why you're ahead with Durez. Every year more foundrymen discover they get more of the advantages of shell molds and shell cores—and *fewer* of the problems—with Durez foundry resins.

You can count on these resins to give you results that don't vary: constant melt point, fast cure, freedom from peel-back; molds and cores of uniformly high tensile strength. That's because Durez resins are made by modern mass-production methods under the watchful eyes of men who have been making resins as long as 30 years.

You're ahead with Durez technical service, too. It's shirt-sleeve service—by men who know how to get the most out of resins where it counts, in your foundry.

To get his experience working for *you*, call in your Durez sales engineer soon.

How-to-do-it information. Regardless of which foundry resins you're using or plan to use, you'll find the new 32-page *Durez Guide to Shell Molding* helpful. Completely revised, it contains recommendations on patterns, materials, mixing, temperatures, lubricants, molds, cores. It's by men who have spent years learning the subject. Write for your copy today.

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vented obtaining of relief in specific instances.

Outlook—Business will not turn up until the third or fourth quarter of 1961, it was predicted by Tom Campbell, editor, *Iron Age*. Recovery will be sparked by housing starts, expenditures for defense, and governmental deficit spending. Steelmaking should boom in early 1962—the mills' labor contracts expire that year. Meanwhile industry will be faced with increased foreign competition and must intensify its selling techniques to compete with new products and new processes being developed currently at home.

Awards—Four industry members were honored at the meeting. Charles R. Gregg, president, Gregg Iron Foundry, El Monte, Calif., was cited for his services as a director of the society. Others who received illuminated scrolls were J. Edward Quest, formerly president, Shakopee Foundry Co., Shakopee, Minn.; J. T. Boyd, vice president and general manager, Goldens' Foundry & Machine Co., Columbus, Ga., and Albert M. Nutter, treasurer, E. L. LeBaron Foundry Co., Brockton, Mass.

Officers and Directors—John E. McIntyre, vice president and general manager, Sibley Machine & Foundry Corp., South Bend, Ind., succeeds Mr. Nutter as president for the coming year.

Others new officers are: Vice President, Cecil R. Garland, secretary and controller, W. O. Larson Foundry Co., Grafton, Ohio; secretary, J. T. Boyd, vice president and general manager, Goldens' Foundry & Machine Co., Columbus, Ga.; treasurer, Paul H. Scherf, executive vice president, Alten Foundry & Machine Works Inc., Lancaster, Ohio; assistant treasurer, W. F. Seelbach, vice president, Forest City Foundries Co., Cleveland. Donald H. Workman was reappointed to serve as executive vice president.

Newly elected directors are James Crowley, president, Pioneer Foundry Co., Jackson, Mich.; Paul W. Kluge, president and treasurer, Tower Grove Foundry, St. Louis; Robert F. Pohlman, secretary-treasurer, Pohlman Foundry Co., Buffalo, and Will H. Sanburn, president, Springfield Foundry Co., Indian Orchard, Mass.

Broad Technical Program Presented at

ALL-CANADIAN CONFERENCE

By WILLIAM G. GUDE
Editor

● ALL - CANADIAN Conference of the American Foundrymen's Society's Eastern Canada and Ontario chapters attracted a heavy attendance to the Sheraton Mount Royal Hotel in Montreal, Oct. 27-28. It was the eighth biennial Canadian meeting.

The two-day program included two afternoons of technical sessions and morning visits to six plants—Canadian Steel Foundries, Canadian Steel Wheel, Dominion Engineering Works Ltd., Jenkins Bros. Ltd., and Warden King Ltd. Max Reading, Foundry Services (Canada) Ltd., was the conference chairman.

Theme of the conference, "Buy Canadian," indicated that Canadian foundry operations recently, like those of the U. S., leave something to be desired. The importance to the Canadian economy of patronizing domestic industry whenever possible was emphasized by T. R. McLagan, president, Canada Steamship Line and the Canadian Manufacturers Association, in addressing the opening day's luncheon. He pointed out that Canadian imports per capita have increased more than twice as fast as have American imports.

Reports on technical papers follow:

Elevated Temperature Properties —Grain Distribution and Casting Finish, by Victor Rowell, Archer-Daniels-Midland Co., Cleveland. The foundryman should seek good flowability and provide enough clay to attain high temperature stability, plus sufficient ramming to prevent mold wall movement.

Grain distribution can affect high-temperature stability of the sand mixture, and a cellulose addition can prevent formation of the clusters of sand grains which impair surface finish of the casting.

Mold and Core Washes — by A. E. Murton, Dept. of Mines and Technical Surveys, Ottawa, Ont. The refractory is the most important ingredient of washes. Although silica is the most commonly used material, graphite, zircon, mica, coke and chrome ore also have been employed. A liquid is required to activate the bond, and water is needed if the wash contains bentonite.

Bentonite is useful as a suspension agent and also acts as a binder but cannot be used alone for the latter purpose. The bentonite and refractory should be mixed before water is added. Prepared washes are preferred to those formulated by the individual foundry.

Logic in Foundry Sands, by George J. Vingas, Magnet Cove Barium Corp. Foundrymen must learn to design and control sand properties through increased study of the variables which influence those properties. We need to know more about the relationship of the variables to each other. Tests show that acceptable castings are produced when certain variables vary widely; this situation calls for improved methods of evaluating properties of sand mixtures.

The Slab Test Block Casting in Sand Control, by George Greiner, Canadian Steel Foundries Ltd., Montreal. This 400-lb casting is a 12-in. cube and has been found useful for comparative purposes in analyzing properties of sand mixtures. Care is needed in interpreting results because some variables that exist in regular production work are not present in making the test casting.

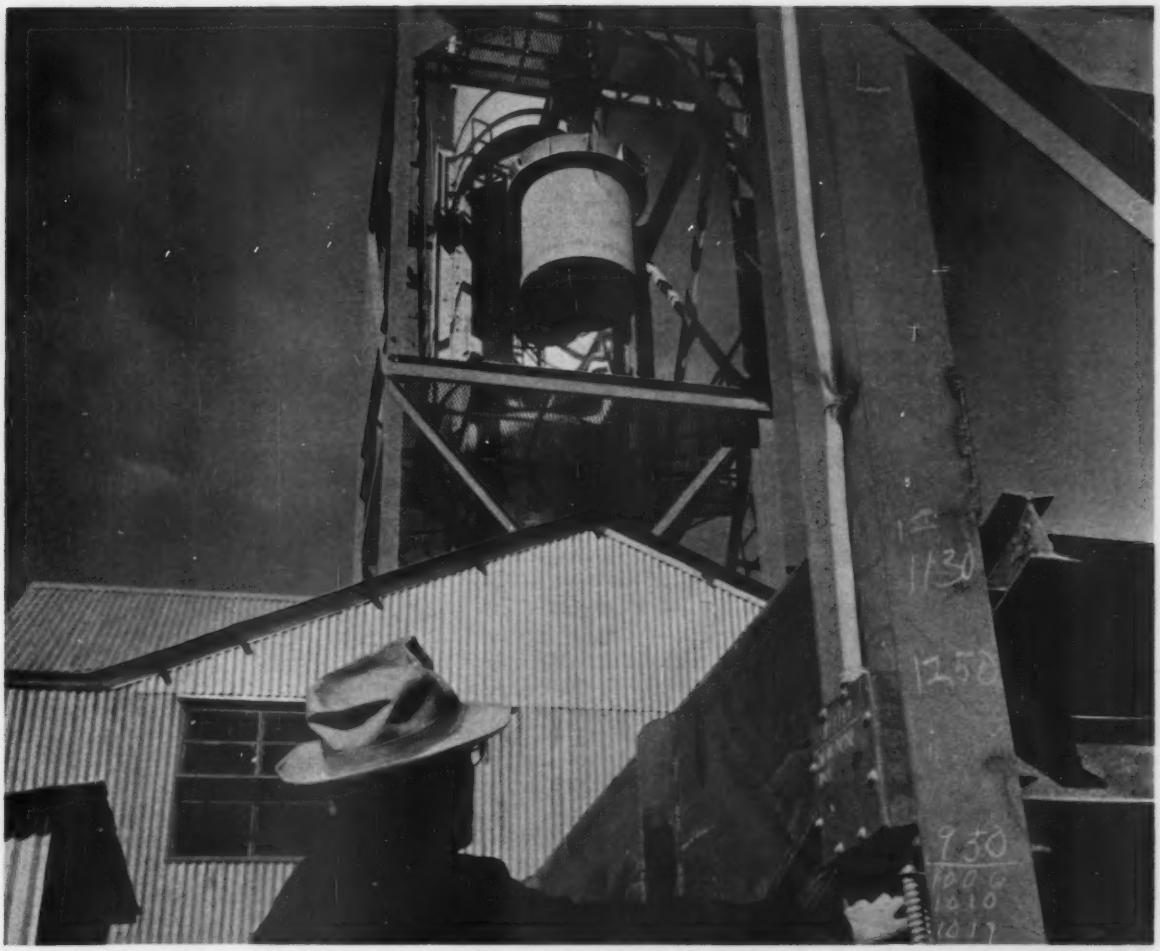
Benefits of Slurry in Foundry Sands, by T. V. Linabury, Miller & Co., Chicago. Advantages of rebonding sand by use of a slurry instead of dry ingredients include a saving in bentonite consumption, reduction in mixing time and in the dust problem at the muller, prevention of clay balling, less labor, and improved sand control. Clay particle size is important, 80 to 100 mesh being best. Western bentonite is particularly suitable as a slurry ingredient because of its water absorbing property and good dispersion. Fireclay, seacoal, and other materials also are used in slurries.

Determination of True Clay and Its Influence on Sand Quality, by Desmond R. Phillips, Dominion Engineering Works Ltd., Montreal. The AFS clay test does not differentiate between clay and the silt and fines accompanying it. A method for determination of true clay and particle size was described.

The true clay content gives a better indication of the green and baked strength than does the AFS clay. This foundry's tests provide better control of green and baked strength than does the usual determination of fine particle size.

Welding as Applied to Foundries, by C. R. Whittemore, Deloro Smelting & Refining Co. Ltd. Important factors in the welding of steel castings include selection of the right electrode, proper preparation of the weld area, and heat treatment of the casting. Organic-coated rods are less satisfactory than lime or mineral coating for carbon steel.

Chemistry of the weld need not match that of the casting, but physical properties should balance. Electrodes should be kept dry, moisture pickup being one of the



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Rhude Media Company of Marble, Minn., now enjoys *extra* profits in producing a fine iron powder used in reclaiming low grade iron ore.

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The two-bucket cycle assures uninterrupted charging for continuous high output, yet requires only four men in the melting department. Rhude meets customer demands for prompt shipment while enjoying substantial savings.

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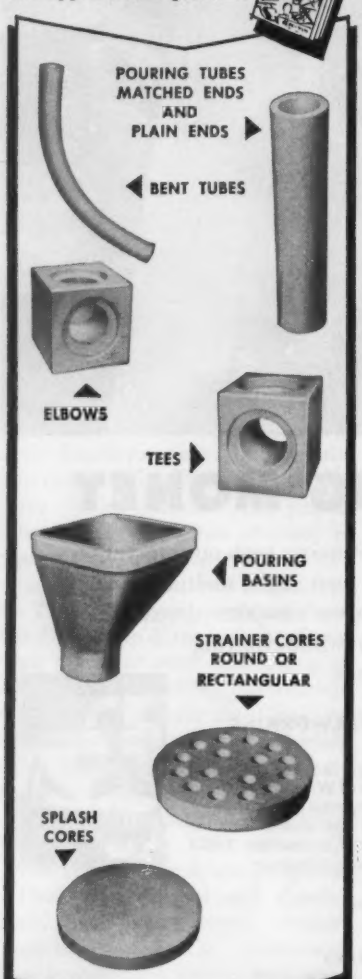

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greatest enemies of sound welds. Internal stresses must be minimized to avoid cracks. Gases and slag are other sources of trouble.

Construction Problems of Large Pattern Equipment, by A. E. Wells, Dominion Engineering Works Ltd., Montreal. Extra care is important in making large patterns because the loss is high if the casting must be scrapped. There are several ways of connecting joints and applying stringers and sheeting, but the best one usually is the cheapest in the long run.

Direct-Arc Steel Melting in the Foundry, by Gerald Tracey and M. Colman, Canadian Steel Foundries Ltd., Montreal. Presented by Mr. Colman. This talk was concerned mainly with desulfurization in the company's new basic electric arc furnace of 25 tons capacity. A single slag is employed with a minimum 2 to 1 lime-slag ratio. It is easier to remove sulfur during the boil than when the carbon is high. An early fluorspar addition immediately after melting also is helpful.

Production Techniques with Ductile Cast Iron, by P. J. Provias, the International Nickel Co. of Canada Ltd. How the magnesium is added to molten iron is as important as the melting of the iron. Addition methods described included the open-ladle practice, injection, pressure, and plunging. The magnesium carrier should be compatible with the iron. Because magnesium recovery increases as the iron temperature is reduced, one addition method first treats low-temperature metal which then is diluted with hotter metal.

One pressure method over-treats a low-sulfur iron with pure magnesium, followed by dilution. Open-ladle additions and the plunging technique are the two methods most commonly used today.

Self-Service Mixing Ladle, by Andre Cecil, Warden King Ltd., Montreal. This foundry's mixing ladle formerly was tipped by rotation of a large hand wheel to distribute metal to pouring ladles. This operation has been mechanized by application of a motor, chain drive and limit switches. The switches provide the most efficient and time-saving pouring cycles.

Iron Melting Furnaces, by F. W. Kellam, Electro Metallurgical Co., Union Carbide Canada Ltd., Toronto. Most foundrymen continue to operate their cupolas as they have done in the past. New developments such as hot blast, water cooling, and improved furnace control should receive increased attention in the interest of more efficient practice.

Casting Defects—Their Causes and Cures, by D. A. Dodson, Foundry Services (Canada) Ltd. Defects in brass and aluminum castings caused by gas inclusions, liquid shrinkage, nonmetallic inclusions, hard spots, penetration, veining, scabs, buckles and other defects were described along with their suggested remedies.

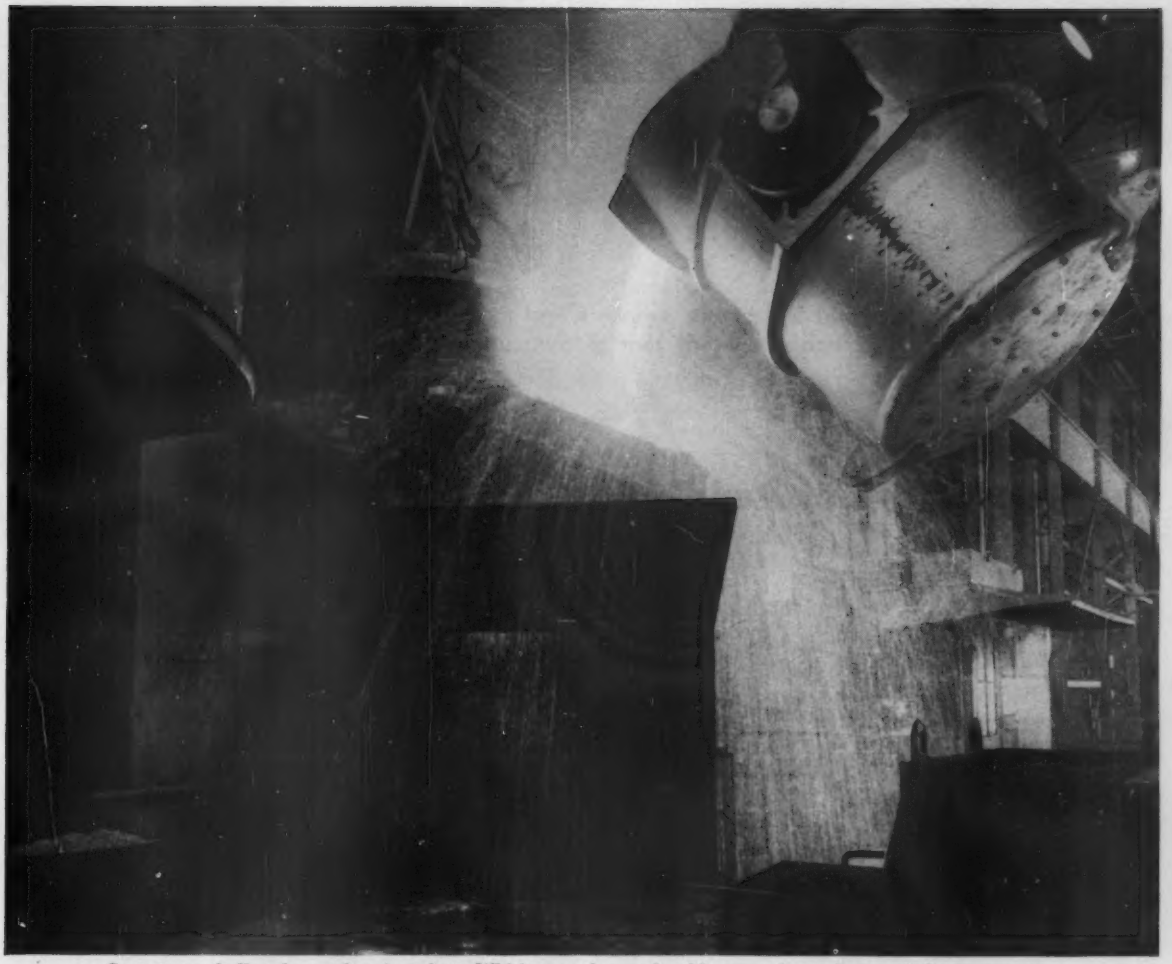
Metallurgy of Aluminum Foundry Alloys, by C. J. Zabek, Aluminum Co. of Canada Ltd., Toronto. In addition to a discussion of the benefits of alloy B135 compared with 135 alloy, the speaker described an instrument for accurate determination of hydrogen content of molten aluminum by the so-called "initial bubble" principle. It is a product of Measurement Engineering Ltd., Arnprior, Ont., Canada.

Book Review

Feuerfestkunde—Herstellung, Eigenschaften und Verwendung feuerfeste Baustoffe **(Refractory Materials—Manufacture, Properties and Applications of Refractory Construction Materials) by Friedrich Harders and Sigismund Kienow, cloth, 981 pages, 8⅜ x 9⅝ in., published by Springer-Verlag, Berlin-Wilmersdorf, Germany. Price 126 DM.**

This German book is a comprehensive discussion of refractory materials. It is divided into seven chapters of which the first relates to general details and discusses properties of refractory materials and their testing. Second chapter deals with silica products, and chamotte products are discussed in chapter three.

Chapter four relates to high-alumina and zircon bearing materials. Basic and neutral refractory materials are discussed in chapter five, and the sixth chapter pertains to carbon refractories. Seventh and concluding chapter relates to lightweight and insulation brick with descriptions of raw materials, brick manufacture, and properties.



Seventy-ton ladle takes molten iron from Whiting continuous hot blast cupolas and pours it into converters.

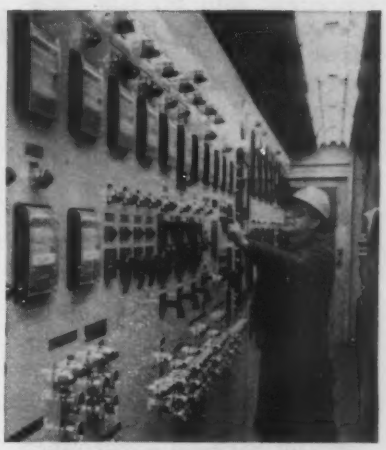
It's Foxboro control for giant new Acme steel plant

Hot Blast Cupolas have capacity of 50 tons per hr. – operate continuously

Cupolas 67 ft. high by 10 ft. in diameter – the world's largest – are under Foxboro control at Acme Steel's new 35 million dollar plant at Riverdale, Illinois.

To keep hot blast cupolas operating at peak efficiency, Acme depends on Foxboro instrumentation. Foxboro temperature, pressure and flow recorders and controllers to keep air leaving preheaters at a constant 1200F. And Foxboro Air Weight Controllers, that meter blast air by weight instead of volume, to help cut fuel costs.

Furnaces, cupolas, preheaters — you'll find Foxboro instruments help operate them all more efficiently. Ask your nearby Foxboro Field Engineer for recommendations for your plant. Or write direct for a copy of Bulletin 13-18. The Foxboro Company, 3212 Neponset Ave., Foxboro, Massachusetts.



Small-case Foxboro Consotrol* instruments (foreground) record and control preheater pressures, temperatures, flows. Preheaters were designed by Fabricating Engineering Co., Inc. *Reg. U. S. Pat. Off.*

FOXBORO

REG. U.S. PAT. OFF.

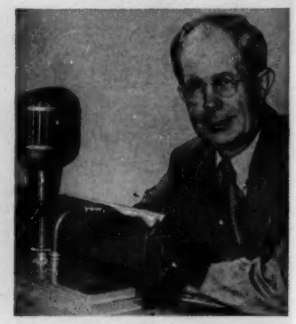
Circle 615 on Page 55

Man to Man

By RALPH L. LEE, *President*

Lee Hobby Foundry
Birmingham, Mich.

"It seems to me that the good will of our suppliers and their representatives is almost as valuable to us as that of our customers"



The Cultivation of Peddlers

● I'VE BEEN ASKED to make a speech before a purchasing agents' convention in Ohio, and the group sent me a copy of its proposed program. This item covered two days of sessions and just about every phase and detail of a purchasing agent's life, health, work, and well being. I'm sure it was sent to help me get my bearings in the field and to prepare my notes, but I must say that I was somewhat overwhelmed with so much material.

After studying the information from these people, I found myself rallying to their cause. On the other hand, I couldn't help being a bit sympathetic with the sales representatives who would have to go up against these highly charged and thoroughly indoctrinated buyers. If only 10 per cent of the ammunition dealt out at the convention took hold, the peddlers really would have to earn their salt, provided that they could overcome their gunshyness.

Many years ago I was pried loose from a job designing electrical apparatus and given the responsibility of testing and approving accessories for use in connection with farm electric lighting and power gasoline engine generators. Our catalog eventually contained a wide variety of objects, from electric irons to water systems and milking machines, all of which were made by outside manufacturers.

Everybody's Buddy—When word got out among the sales representatives that I was the neck to the bottle as far as their products were concerned, I suddenly was swamped with the friendliest bunch of callers I ever had in my life. At first I had one heck of a time getting home for a meal with the family, and I still have one whole bundle of fountain pens, desk knickknacks, penknives, cigar cutters, and other trivia given to me as proof of the esteem, admiration, and friendship of those who were trying to sell me something.

Be kind to your vendors

But when I was threatened with more costly gifts and entertainment, I made up my mind that I would have to call a halt to such silly and transparent apple polishing shenanigans. It didn't have one darned thing to do with my assignment—that is, selecting apparatus that could be hooked up to our lighting plants way out in the country, would do a good job for our customers, and would keep on working through thick and thin.

The next time a salesman's visit lapped over into the lunch hour I said, "It was thoughtful of you to invite me, but today you will be our guest."

He guffawed, "You will not! This is on me. After all, who's doing what to who?"

A Good Question—"A very good question," I said. "We're trying to select reliable accessories for our customers. Take an electric iron, for instance. Suppose something goes wrong with it, and I'll tell you what will happen. One of our dealers will have to drive out into the country to see what's wrong, for farmers at this point are all thumbs electrically. Chances are that the prospect of having an electric iron clinched the deal for the purchase of the lighting plant in the first place."

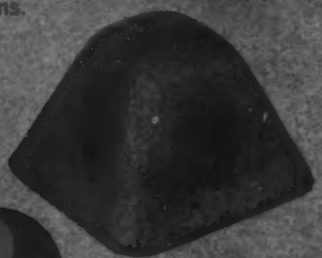
"So, Mr. Salesman, I hope that

Circle 616 on Page 55→

Tramp elements begone!

GLOBE SILVERY IRON is virgin metal produced in a blast furnace from natural iron ores. Tramp elements are therefore at a minimum.

Closer chemical and physical control in the cupola is possible when Globe Silvery is used and you avoid the need for highly concentrated alloy additions.



P M

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Iron Ore • Pig Iron • Coal • Coke • Ferroalloys
Lake Fueling • Lake Shipping

the object of your visit today is to help us pick the kind of product we've got to have to make and keep our customers satisfied. Buying me a lunch will not affect your product one way or another. It will have to stand on its own two feet, regardless of how friendly we feel toward each other."

By following this practice and having an understanding with salesmen as to "who's doing what to who?" I found that most salesmen were glad to get rid of the apple-polishing pretense and concentrate on the real subject at hand—presenting their product as a means of helping us.

As time went by, we found that with us in the role of prospective beneficiaries of salesmen, not only did the petty efforts to curry personal favor fade out of the picture, but the sales people went out of their way to help us with problems which lack of experience made it difficult for us to solve by ourselves. And they went beyond the call of duty, I might add.

I imagine that most of us in the foundry business have far too much to do to receive every Tom, Dick, and Harry who thinks he has something we ought to buy. On the other hand, I feel sure that a fixed, belligerent "just try to sell me" manner of greeting rank-and-file salesmen can be pretty costly.

For example, a sculptor in Canada wrote me a short time back to ask how he should go about setting up a little foundry of his own. He even wanted me to suggest a layout. I thanked him for doing me the honor, but confessed that the problem was considerably beyond me, both time and knowledgewise. I suggested he get in touch with representatives of his foundry suppliers and equipment people. "They're a good lot," I told him, "and they know their onions. I know from experience."

Suppliers Aid Progress — When you get right down to it, a great deal of the progress we have made in the foundry business has been due to the research and development work done by our suppliers, and one whale of a lot of problem solving in individual foundries has been done by representatives of suppliers.

Of course, no one does anything for nothing; we all have to eat. It seems to me, however, that even though the buyer seems to have the whip hand at times, he's not doing any more for the salesman than the salesman is doing for him —not for long at least.

In the Lee Hobby Foundry, we manage, with a struggle at times, to pay our bills when they're due, but considering the peewee dabs of supplies and equipment we buy, it's a wonder that any salesman would have anything to do with us—but they do, and, by golly, they're welcome. They've helped us out of many a fix, got stuff for us in a pinch when it looked impossible, and they've sent us data we couldn't dig up for ourselves.

Good will usually is priced and put down on the books as a real asset. We ordinarily think of it in terms of our customers. It begins to seem to me that the good will of our suppliers and their representatives is almost as valuable.

OLD STYLE GRINDERS
WASTE UP TO 45% OF YOUR GRINDING WHEELS!
AS WHEEL WEARS, SPEED DECREASES, PRODUCTION SLOWS!
STANDARD
INFINITELY VARIABLE SPEED
SNAGGING GRINDERS
adjust automatically with wheel wear to maintain proper peripheral speed.
You get FULL WHEEL WEAR DOWN TO THE FLANGES!
33VR
LEFT HAND
Write Today for Literature

By merely turning a handle — *no tools required* — constant adjustment of wheel speed to compensate for wear is another EXCLUSIVE from STANDARD. STANDARD SNAGGING GRINDER installations coast to coast report wheel savings as high as 100% and increased production of up to 50%. Write today for our "Case History" file of *Savings Up-Cost Down Stories* that are proof positive!

FOUNDRY GRINDER DIVISION

the STANDARD electrical tool co.

SINCE 1912

SNAGGING GRINDERS AND MACHINE TOOLS

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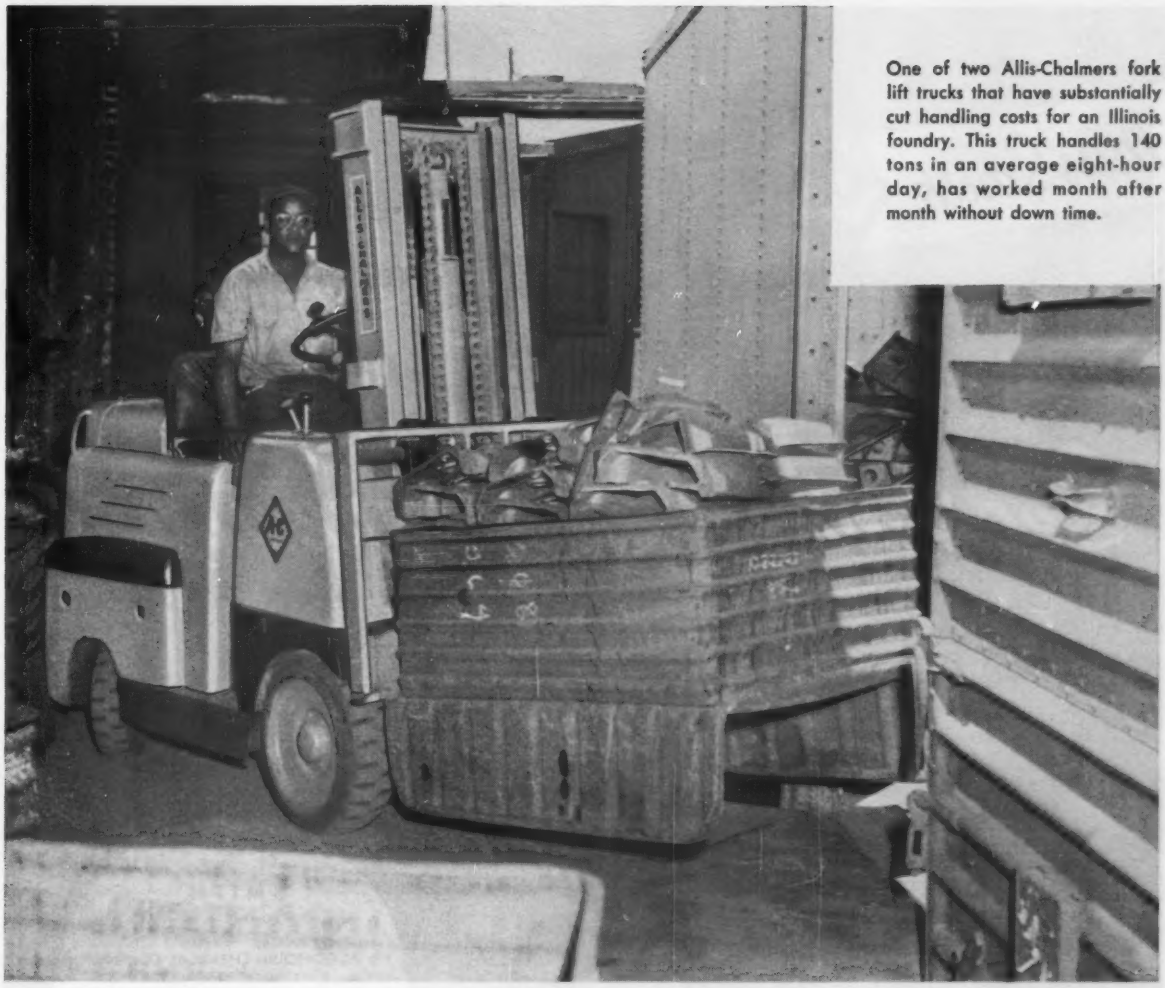
HALLMARK OF METALWORKING THROUGHOUT THE WORLD



One of two Allis-Chalmers fork lift trucks that have substantially cut handling costs for an Illinois foundry. This truck handles 140 tons in an average eight-hour day, has worked month after month without down time.

There's a

dollar-saving difference

in Allis-Chalmers Lift Trucks

. . . and the difference grows by the hour.

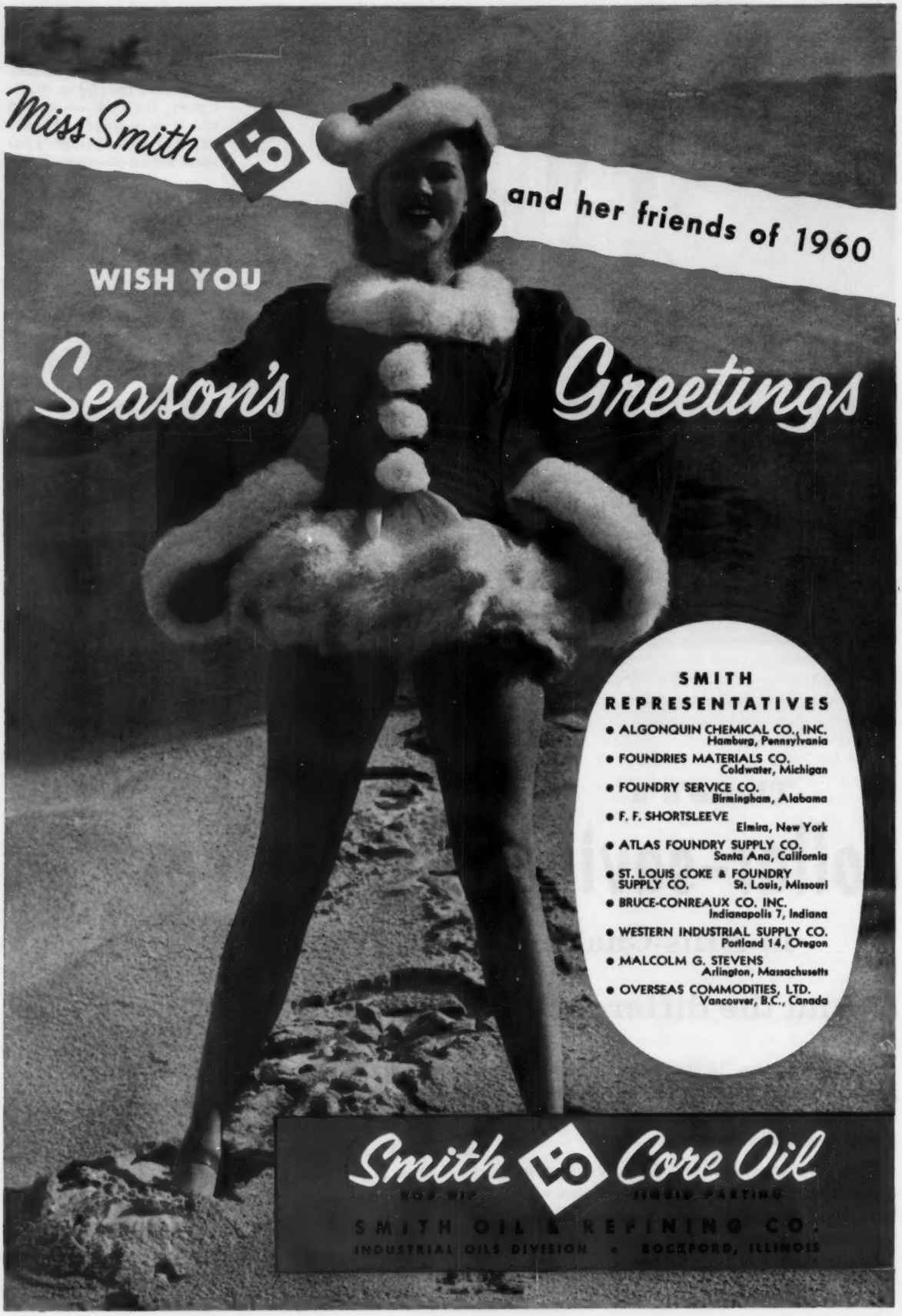
Sometimes it takes 10,000 hours or more to prove: No other lift truck can be expected to operate as steadily, as economically for as long a time as an Allis-Chalmers.

This is a conclusion reached by users in many different industries. They are users who have kept detailed records of operation and maintenance costs . . . that *prove* there is a dollar-saving difference. Many of their case histories are available for the asking.

Let your Allis-Chalmers dealer show you some of the many years-ahead design features that make the dollar-saving difference. Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

BH-128A


Miss Smith
and her friends of 1960
WISH YOU
Season's Greetings
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Hamburg, Pennsylvania
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• ST. LOUIS COKE & FOUNDRY SUPPLY CO.
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Indianapolis 7, Indiana
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Left to right are Thomas E. Smith, program chairman; Howard B. Voorhees, chairman, conference committee; and James C. Maggart, assitant program chairman

Herbert J. Weber, left, and George P. Dahm spoke at the technical session which was devoted to the manufacture of castings from leaded steel

Theory and Practice Discussed at

PURDUE FOUNDRY CONFERENCE

By ERLE F. ROSS

● SOLIDIFICATION of metals, production of leaded steel castings, economics of the shell core process, quality control, and preventive maintenance, were featured topics at the 13th annual Metals Casting Conference at Purdue University, Oct. 27-28.

The conference was sponsored by the university's School of Metallurgical Engineering and Division of Adult Education in co-operation with the Michiana and Central Indiana Chapters of the American Foundrymen's Society. Registered attendance approximated 175, exclusive of students in metal processing classes.

Howard B. Voorhees, manufacturers' agent, Mishawaka, Ind., was conference chairman. After convening the opening session, he introduced John W. Hicks, assistant to the president, Purdue University, who extended the university greeting. He stated that students on campus this year are at an all-time high of 15,286, and that quality of students continues to improve.

Conference response to the university greeting was made by David W. Boyd, AFS regional vice president and general manager, Engineering Castings Inc., Marshall, Mich. He referred to the society membership of 12,800 and enumerated the services which the organization sponsors for their benefit.

Thomas E. Smith, plant manager, Central Foundry Div., General Motors Corp., Danville, Ill., was conference program chairman. James C. Maggart, Sibley Machine & Foundry Co., South Bend, Ind., was assistant program chairman. Digests of the program papers follow:

Solidification of Metals, by R. W. Ruddle, technical manager, Foundry Services Inc., Cleveland. Reasons why knowledge of solidification phenomena is important were covered.

Freezing characteristics of different metals and alloys were discussed and the influence of the different modes of freezing on the incidence of shrinkage unsoundness in castings was considered. The different freezing characteristics necessitate different techniques in gating, chilling and risering.

It was shown that the rate of freezing is controlled almost entirely by the thermal characteristics of the mold. The way in which a mold absorbs heat from the metal in the mold cavity was discussed.

In the future electronic or other computers may be used to predict in detail the freezing of castings thus enabling foundrymen to locate chills, risers, and gates with complete certainty as to their effect on freezing.

Melting of Copper-Base Alloys, by Ray Cochran, metallurgical engineer, R. Lavin & Sons Inc., Chicago. Foundrymen must produce castings having physical and mechanical properties competitive with those of forgings, weldments, and other wrought forms. There are many casting alloys with adequate properties but the preservation of those properties during the foundry process, and their transfer from alloy to casting is a major problem. Of all the variables involved, melt quality has the most far-reaching effect on the end product.

It is important that some practical method of measuring melt quality be devised and used. Conventional laboratory measurements of melt quality are useless as production control measures.

Achievement of constant high melt quality is the result of metallurgically sound practice with melting department personnel properly trained to maintain that practice.

Cupola Control and Practice, by Robert H. Greenlee, general superintendent, Auto Specialties Mfg. Co., St. Joseph, Mich. Selection

John B. Leath, left, was a speaker at one of the two steel sessions. George C. Dickey, right, served as the technical chairman for this session

Speakers at a session covering the subject of preventive maintenance were (left to right) John A. Shelby, C. Glenn Snellenberger, and Robert L. Clark

and melting of scrap is a paramount consideration in cupola control.

Care also must be exercised in selection of coke. Considered in this matter were coke size ratio to cupola diameter, uniformity of the coking operation as affecting analysis, and ratio of the coke to the melt. Uniformity in daily cupola repairs and in charging operations, particularly accurate weighing, also are necessary.

Tools which aid cupola operation and reduce cost are hot blast and humidity control. Heating of the blast to 400° F can reduce coke consumption as much as 15 per cent. The hot blast reduces the effect of bridging, reduces melt losses, and provides hotter iron. Humidity control makes for more uniform melting and the reduced moisture in the blast reduces fuel requirements.

Manufacture of Leaded Steel Castings—Equipment, Safety, and Production Features. This was a three-part presentation with George P. Dahm, regional engineer, Linde Co., Cincinnati, discussing "Equipment"; Herbert J. Weber, director of the Safety, Hygiene and Air Pollution Control Program, AFS, discussing "Safety"; and Russell Plum, metallurgist and quality control engineer, Keokuk Steel Casting Co., Keokuk, Iowa, dealing with "Production Features."

The latter contributor was grounded by bad weather in his flight from Keokuk to Lafayette, but his comments were made by long distance telephone and a tape recording.

Mr. Dahm stated that leaded steel castings are the outgrowth of leaded steel ingots, purpose of the lead being to improve machinability. Some common problems exist. In ingots, lead shot is introduced into the ladle stream as the ingots are poured, and this must be done at the right time and manner to avoid lead segregation. In castings the pouring time is short, and lead powder must be put into the metal stream carefully and at a uniform dispensing rate.

Mr. Weber reported that, in foundries, lead is added to the ladle as lead shot or litharge (PbO) and 0.15 to 0.18 per cent is retained in the castings. The amount of lead in the parent metal is no gage of the hazard. M.A.C. for lead is 0.2 mg/cu m or 2 millionths oz per cubic foot of air.

Lead enters the body by inunction, ingestion, and inhalation. Absorption causes intoxication. Controls against lead poisoning are substitution, ventilation, isolation and personal protection.

Mr. Plum described the production of leaded steel castings in his foundry and discussed the hazards and how they are met. Improved equipment is needed for introducing lead to the metal.

Gating and Risering of Nonferrous Alloys, by Robert A. Colton, manager, American Smelting & Refining Co., Houston, Texas. This discussion was confined to aluminum. Turbulence of that metal has an important bearing on the quality of castings.

A very thin oxide coating forms on the surface of molten aluminum, and, if this oxide gets mixed in the metal, it will show up in the castings. Large round sprues and sprues in the center of a mold contribute to turbulence. Turbulence can be controlled by good gating.

Because aluminum is light, it can not be made to fill a mold against air pressure, such as entrapped air in the mold. Adequate venting of the mold is important.

Relation of Microstructure to the Mechanical Properties of Gray Iron, by S. C. Massari, technical director, AFS. Typical structures characteristic of various grades of gray iron were portrayed and related to the mechanical properties of the metal, with emphasis on the fact that the properties of any metal are attributable to the microstructure rather than to the chemical analysis.

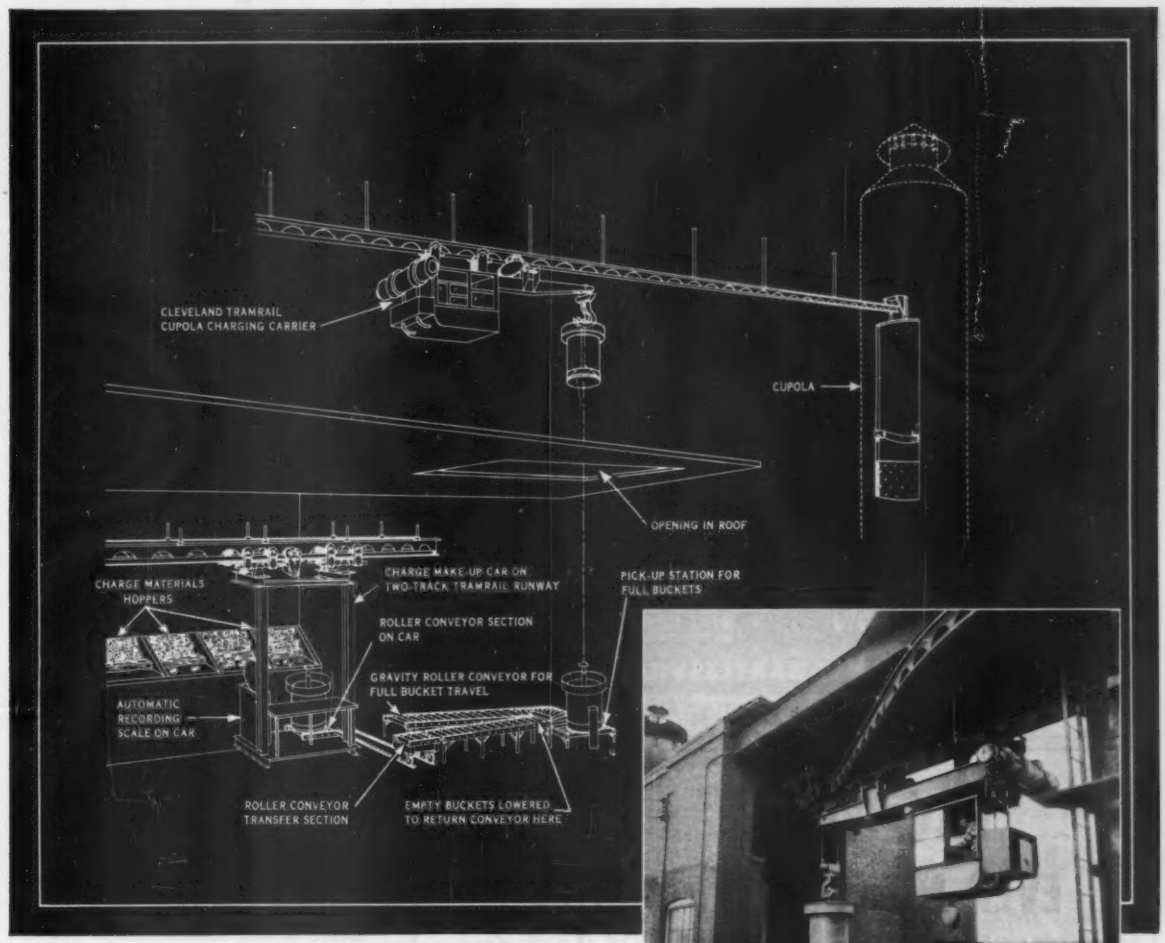
It was pointed out that after some experience, particularly with a given type of gray iron, an examination of the microstructure makes possible estimating the mechanical properties within comparatively narrow limits.

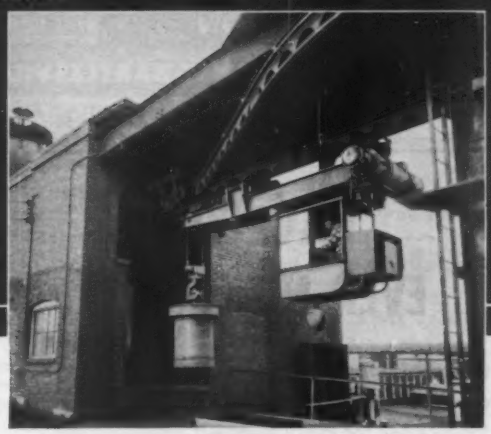
Relation of Practical Stress Patterns to the Operating Foreman's Job, by John B. Leath, engineer, Harrison Steel Castings Co., Attica, Ind. Aspects of casting design and stress analysis which the foundryman should understand if he is to take full advantage of the casting process were presented. The primary responsibility for design must rest with the designer, but the foundryman has a duty in assisting the designer in making parts in a way that they will perform their function in service.

The discussion dealt with such service requirements as bending, torsion, fatigue life, stress concentra-

Cupola Charging Made Fast And Easy

Unique System Reduces Manual Labor to Minimum


CLEVELAND TRAMRAIL CUPOLA CHARGING CARRIER
CUPOLA
OPENING IN ROOF
CHARGE MATERIALS HOPPERS
CHARGE MAKE-UP CAR ON TWO-TRACK TRAMRAIL RUNWAY
PICK-UP STATION FOR FULL BUCKETS
ROLLER CONVEYOR SECTION ON CAR
GRAVITY ROLLER CONVEYOR FOR FULL BUCKET TRAVEL
AUTOMATIC RECORDING SCALE ON CAR
ROLLER CONVEYOR TRANSFER SECTION
EMPTY BUCKETS LOWERED TO RETURN CONVEYOR HERE



Cleveland Tramrail cupola charger approaching the furnace room. The bucket holds 2000 lbs. of charge materials.

ILLUSTRATED here is a dependable tried and proven Cleveland Tramrail cupola charging system that has been in operation at the Standard Foundry Company, Worcester, Mass., for 12 years. This system includes a cab-operated crane in the raw material storage and equipment for making up charges and delivering them to the cupolas.

Charge buckets are filled on the first floor by use of a Tramrail charge make-up car. Materials are fed directly into a bucket as the car moves from one raw materials hopper to another. When full, the bucket travels by gravity roller conveyor to a pick-up station. Here, as illustrated in sketch, the Cleveland Tramrail charging carrier on the second floor level takes over. Without any floor assistance, the hoist hook engages with the bucket stem. The bucket is lifted to high position and delivered directly to cupola. After the charge is dumped, the bucket is lowered to the roller conveyor and returned to the starting point.

The Cleveland Tramrail system is fast, efficient and easy to maintain. It has solved the difficulty of finding men for the laborious work as it was formerly. It has taken the drudgery from the work and elevated the men from laborers to operators.

CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

Write for free booklet 2008

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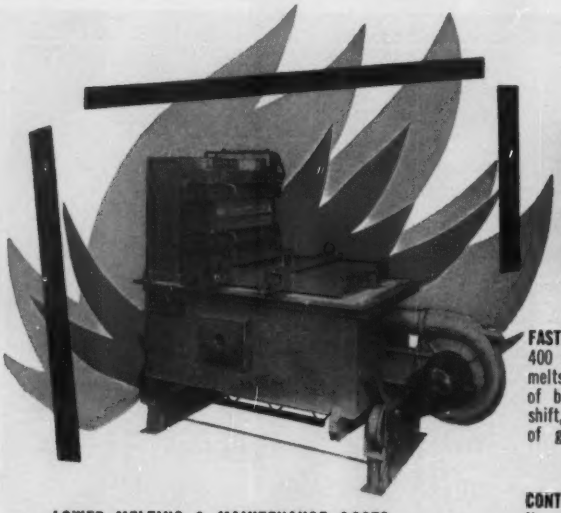
Circle 620 on Page 55

SAVE $ WITH REDA FURNACES

FUEL SAVINGS UP TO 50% REPORTED
USING REDA GAS-OIL FIRED FURNACES!



BEST HEAT EFFICIENCY

FASTER MELTING — One 400 series Reda Furnace melts up to 11,000 lbs. of brass or bronze per shift, and up to 6,000 lbs. of gray iron per shift.

LOWER MELTING & MAINTENANCE COSTS— One man can operate a Reda Furnace . . . No daily repairs needed!

CONTINUOUS POURING — No waiting until floors, flasks, boards, etc. are filled with molds!

FURNACE DIVISION — WRITE TODAY FOR DESCRIPTIVE BULLETIN
REDA PUMP COMPANY - BARTLESVILLE, OKLAHOMA

Circle 621 on Page 55

HAVE YOU EVER NOTICED

the many types of headings under which classified ads are listed? There's one for every want—if you want to obtain qualified personnel, want to sell used machinery, want to buy equipment, or want a better position, you should advertise in the classified section of FOUNDRY.

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advertising dept.
FOUNDRY
Cleveland 13, O.

tions, yield point, ultimate stress, grain size, normalizing, and workmanship.

Sloppy workmanship which produces soft ramming, improper core setting, shifts, fins, mold erosion, poorly made or poorly finished cores, results in imperfections which cause trouble. Proper pouring speeds and temperatures are important. Everyone in the cleaning room must be made to understand the necessity for shipping castings free from imperfections which would cause stress concentrations and eventual failure.

Quality Control, by Harry S. Kindle, manager of quality control, Cummins Engine Co. Inc., Columbus, Ind. The speaker's company buys from approximately 35 foundries about 4 million castings per year, ranging from 0.2 to 1500 lb each and totaling between 18,000 and 20,000 tons. As a manufacturer of high quality diesel engines, it must have quality castings. The company believes its suppliers of castings must recognize the requirements of their customers.

Foundries must provide stronger and more capable quality control systems to meet the needs of their customers. This must be done without burdensome cost. The endeavor could prove profitable for the foundry as well as for the customer.

Adaptability and Economics of the Shell Core Process, by M. H. Horton, supervisor of foundry services, materials engineering department, Deere & Co., Moline, Ill. Deere has found that the shell core process shows a saving, compared with oil cores, for some applications but not for others.

The company will not realize the savings it had expected from adoption of the shell core process. This is due to the increased cost of shell molding materials and the lack of productivity with the process. Furthermore, the process must be adopted on a selective basis, for example, used in those applications where it provides the greatest economy.

Preventive Maintenance, a panel discussion by C. Glenn Snellenberger, supervisor of maintenance, Dalton Foundries Inc., Warsaw, Ind.; John A. Shelby, chief equipment design engineer, Motor Truck Division, International Harvester Co., Indianapolis; and Robert L. Clark, chief metallurgist, Golden

Foundry Co. Inc., Columbus, Ind.

Mr. Snellenberger stated that good preventive maintenance starts on the drawing board in layout and planning. Equipment must fit the operations, and the maintenance manager should be consulted in its purchase because he will be responsible for keeping it operating. By making sure equipment has adequate capacity, is rugged, yet simple, much future maintenance can be prevented.

Should Keep Records

Records should be kept on all equipment, providing information on the manufacturer, serial number, date of purchase, cost, repair parts list, maintenance costs for parts and labor, lubrication information, and other pertinent data. Regular equipment inspection plays a major part in preventive maintenance. Many larger plants provide an inspection card on which the maintenance man will check off the items as they are inspected. These reports are a guide to the frequency of maintenance and planned overhauls.

Mr. Shelby said that mis-location of preventive maintenance in the over-all company organization plan can cause complications. Preventive maintenance should be located in the organization chain in such a way that it must answer for its own mistakes.

Clerical procedure is the easiest area for complexity to get out of hand. After a program gets going it may grow unnecessarily. Mr. Clark discussed a preventive maintenance program being set up at his company. Basic steps in setting up an effective operation of a preventive maintenance program are: 1. Sell management. 2. Train subordinates. 3. Institute a record system. 4. Organize a well-qualified staff of maintenance personnel. 5. Maintain a stockroom for critical parts.

A group of students enrolled in the Foundry Educational Foundation program were guests at the conference dinner. Program Chairman Thomas E. Smith, plant manager, Central Foundry Division, General Motors Corp., Danville, Ill., was master of ceremonies. Prof. George E. Davis, director, Division of Adult Education, Purdue University, spoke on "Hoosier Philosophy." Prof. Davis is a leading authority on James Whitcomb Riley, Indiana's famous poet and author, and his commentary and numerous Riley readings provided outstanding entertainment.

Safety Group Offers Courses In Industrial Safety Training

National Safety Council is sponsoring a series of one-week courses in safety training for both beginners and veterans. Four courses are offered: 1. Fundamentals of Industrial Safety. 2. Safety Management Techniques. 3. Industrial Hygiene For Safety Engineers. 4. Radiation Safety.

Classes will be held at the council's offices, and students are provided texts and reference materials. Further information on enrollment for the 1961 sessions can be obtained from the National Safety Council, 425 N. Michigan Ave., Chicago 11.

ON Your CUPOLA...
WHAT COULD BLOWER BREAKDOWN
-Cost You?
Probably plenty! That's why . . . on original equipment or for replacement . . . foundrymen prefer SPENCER blowers, superior on many counts, including:
DEMONSTRATED DEPENDABILITY—Thousands in use for many years with no down time.
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MINIMUM MAINTENANCE—Simple, rugged construction (lightweight impellers the only moving parts) lessens need for attention or adjustment.
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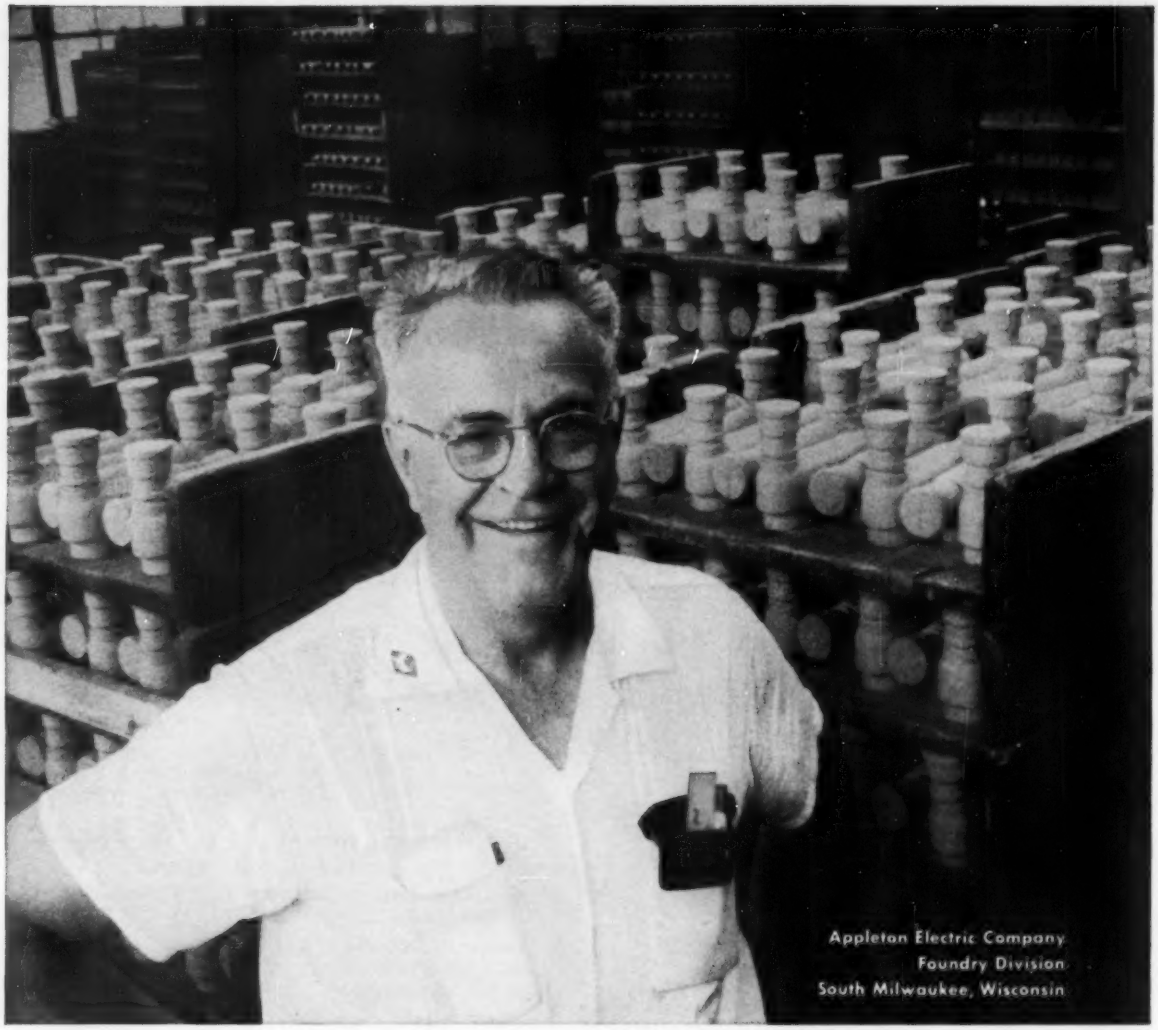

"The pace...terrific...50,000,000 cores a year...we do it with one core oil...Cities Service #58"

The foundry division of Appleton Electric Company is noted for being one of the most modern, highly mechanized, and fastest paced in the business. Often cores still warm from being made in the morning are used that same afternoon. There just isn't time to store them. There isn't time for interruptions or down time either.

To accomplish this, the foundry depends on the most modern equipment, highly skilled men and women, and Cities Service Delco #58 Core Oil. With this *one* oil, they get consistently high-quality core production. Delco #58 remains the same from batch to batch, month in and month out. It's this kind of dependability that keeps those 50,000,000 cores on the line, ready to be used when they're needed. And in the foundry of Appleton Electric they're always needed "right away."

Every year, more and more manufacturers are taking advantage of the dependability and high-quality of Cities Service Delco Core Oils. If you'd like to know more about them, and how they can help speed up and improve your operations, why not talk with your Cities Service Lubrication Engineer? He is *trained* to help you find the core oil to meet your specific problems. Or if you prefer, write: Cities Service Oil Company, 20 N. Wacker Drive, Chicago 6, Illinois.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Literature for Foundrymen

For More Information Use Reader Service Card—Page 55

Noise Prevention

Catalog illustrates sound control applications with illustrated graphs showing reduction of noise in decibels. Charts show flow rates and operating specifications.—**Allied Witan Co.**, 12500 Bellaire Rd., Cleveland 35, Ohio.

For More Details Circle No. 406—Page 55

Stainless Alloy

Six-page folder titled "Stronger Cast Stainless Keeps Promises" describes performance on CD-4MCu hardenable cast stainless alloy.—**Alloy Casting Institute**, 1001 Franklin Ave., Garden City, New York.

For More Details Circle No. 407—Page 55

Thermocouple Components

Catalog C 100-3 contains specifications and ordering information on replaceable components for company's thermocouple assemblies.—**Minneapolis-Honeywell Regulator Co.**, Wayne and Windrim Avenues, Philadelphia 44, Pa.

For More Details Circle No. 408—Page 55

Equipment Rental

Booklet explains the advantages of renting material handling equipment and features a one-page chart for use of equipment owners in determining advantage of renting versus owning their own equipment.—**Clark Equipment Co.**, 485 Lexington Ave., New York 17, N. Y.

For More Details Circle No. 409—Page 55

Epoxy Adhesives

Adhesives properties chart contains information on epoxy adhesives, their application, cure times, and physical properties. Chart includes data on test methods, applications, and availability.—**Furane Plastics Inc.**, 4516 Brazil St., Los Angeles 39, Calif.

For More Details Circle No. 410—Page 55

Conveyor Chains

Bulletin 5860 contains sprocket specifications and engineering and application data on conveyor chains. Bulletin 56-74 describes various types of conveyor chains and lists their dimensions, strengths, and weights.—**Chain Belt Co.**, Milwaukee 1, Wis.

For More Details Circle No. 411—Page 55

Foundry Products

Bulletin CS100-000 discusses ultrasonic testing techniques, radiography, fluorescent penetrants, temperature-indicating paints and crayons, ultrasonic cleaning, a high-temperature research furnace, and electrical ceramics. — **Curtiss-Wright Corp., Princeton Div.**, Princeton, N. J.

For More Details Circle No. 412—Page 55

Cranes

Folder illustrates and describes three models of overhead cranes and lists basic crane control requirements.—**Milwaukee Crane**, division of Novo Industrial Corp., Cudahy, Wis.

For More Details Circle No. 413—Page 55

Motor Controls

Pocket catalog describes electric motor controls in 56 pages. Booklet 60 also includes motor rating and heater coil data plus simplified tables for motor control selection.—**Furnas Electric Co.**, 1151 McKee St., Batavia, Ill.

For More Details Circle No. 414—Page 55

Welding Training Aids

Fifty welding training aids, including books, movies, charts, and material on welding specifications, are listed and described in folder.—**Hobart Welding School**, Troy, Ohio.

For More Details Circle No. 415—Page 55

Idlers

Book 2716A, a supplement to Book 2716, contains capacity ratings and design information for 35-degree idlers. It lists types of 35 and 45-degree idlers for belt widths from 24 to 60 in.—**Link Belt Co.**, Dept. PR, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 416—Page 55

Insulation

Bulletin J-661 presents thermal and acoustical characteristics of company's insulation designed for service from subzero temperatures to 450° F.—**Baldwin-Ehret-Hill Inc.**, 500 Breunig Ave., Trenton 2, N. J.

For More Details Circle No. 417—Page 55

Castable Ceramic Fiber

Technical data sheet describes castable form of ceramic fiber which can be used directly from the shipping container.—**Carborundum Co., Ceramic Fiber Project, Research & Development Div.**, Niagara Falls, N. Y.

For More Details Circle No. 418—Page 55

Quenching Oils

Technical bulletin contains data on two new quench oils. Bulletin cites characteristics of the new oils and outlines benefits obtained from their use.—**Sun Oil Co.**, Industrial Prod. Dept., 1608 Walnut St., Philadelphia 3, Pa.

For More Details Circle No. 419—Page 55

Fire Hose

Four-page folder presents specifications for 12 different styles of fire hose. Bulletin No. S-230 also contains information essential to correct fire hose selection.—**Fyr-Fyter Co.**, 221 Crane St., Dayton 1, Ohio.

For More Details Circle No. 420—Page 55

Concrete Floors

Bulletin MP-4d describes concrete floors containing iron particles. Photographs, diagrams, and installation procedures are provided in 24 pages.—**Master Builders Co.**, Cleveland 18, Ohio.

For More Details Circle No. 421—Page 55

Roof Exhausters

Form 60-Al discusses operation, installation, and maintenance of roof exhausters. Included are specifications, ratings, and data on dimensions.—**Iron Lung Ventilator Co.**, 5403 Prospect Ave., Cleveland 3, Ohio.

For More Details Circle No. 422—Page 55

Retooling Plan

Form 5250A shows how retooling program can increase output of power tool operations and offers basic formulas for computing dividend possible by planned

Did You Miss These?

Here is a list of popular literature items offered in recent months:

MISCHMETAL ("Recommended Additions of CerAlloy 100 in Precision Castings")—Cerium Metals & Alloys Div., Ronson Metals Corp., Newark 5, N. J. Circle 402, Page 55.

CO_2 PROCESS ("CO_2 Applications for the Modern Foundry")—Liquid Carbonic, a division of General Dynamics Corp., Chicago 3, Ill. Circle 403, Page 55.

SAND BINDERS—Corn Products Div., Corn Products Sales Co., New York 22, N. Y. Circle 404, Page 55.

INVESTMENT CASTING PROCESS —Shaw Process Development Corp., Port Washington, N. Y. Circle 405, Page 55.

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COMPANY

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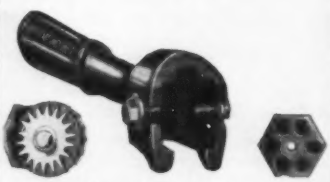
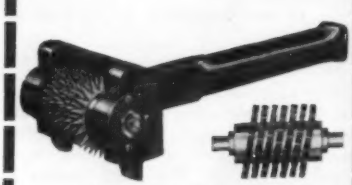


Desmond Hex Dresser

LIVES FOR FOUNDRY GRINDING WHEEL



Desmond Heavy Duty Dresser

DRESSERS

Cut grinding and snagging costs with inexpensive Desmond Hex dressers. They bring grinding wheel faces to "new" efficiency by removing loaded metal and exposing sharp abrasive grains. And Hex dressers provide six sets of bearings in one set of bearing blocks . . . for extra life on average wheels. For resinoid and rubber bonded high-speed wheels use the ball-bearing Desmond Heavy Duty Dresser. Ask your Desmond distributor's advice.

Desmond

Desmond-Stephan Mfg. Co.
Urbana, Ohio

Circle 624 on Page 55

annual retooling. It includes a slide rule computer for rapid calculation of gross dividend on payroll dollars.—**Ingersoll-Rand Co.**, 11 Broadway, New York 4, N. Y.

For More Details Circle No. 423—Page 55

Torque Converter

Bulletin 465A features data on a torque converter and automatic transmission for company's line of lift trucks.—**Allis-Chalmers, Engine-Material Handling Div.**, Milwaukee 1, Wis.

For More Details Circle No. 424—Page 55

Compressed Air Units

Bulletin 0400-B1 contains 20 pages which provide engineering and application data on filters, regulators, and lubricators. Each unit is diagramed and accompanied by dimensional drawings and tables.—**Hannifin Co.**, Dept. 238, 501 S. Wolf Rd., Des Plaines, Ill.

For More Details Circle No. 425—Page 55

Safety Equipment

Supplement to company's Catalog 28 describes company's safety glasses and face shields. Booklet also explains the advantages of plastic filter plates for welding helmets.—**Cesco Chicago Eye Shield Co.**, 2727 W. Roscoe, Chicago 18, Ill.

For More Details Circle No. 426—Page 55

Flexible Connectors

Catalog 539 illustrates and describes flexible metal connectors in both carbon and stainless steel. Complete specifications including pressures, working temperatures, and installation methods are given.—**Cobra Metal Hose**, 5059 S. Kedzie Ave., Chicago 32, Ill.

For More Details Circle No. 427—Page 55

Cleaning Equipment

Leaflets describe wear plates with replaceable centers; table blast pads with replaceable centers; and tumbling barrel liners.—**A. I. C. Engineering Co.**, P. O. Box 55421, Uptown Station, Indianapolis, Ind.

For More Details Circle No. 428—Page 55

Diecasting Machines

Bulletin offers information on high-pressure hydraulic diecasting machines. Its 12 pages contain specifications for seven sizes from 100 through 2000 tons and lists optional equipment.—**Cleveland Automatic Machine Co.**, 4932 Beech St., Cincinnati 12, Ohio.

For More Details Circle No. 429—Page 55

Furnaces

Folder illustrates and discusses company's various models of oil and gas-fired furnaces and their capacities.—**Warwick Furnace & Engineering Corp.**, 452 W. Chicago Ave., Chicago 10, Ill.

For More Details Circle No. 430—Page 55

Mold Handling Systems

Bulletin 135 contains diagrams and descriptions of mold handling systems and includes photographs of typical mold handling system installations.—**C. O. Bartlett and Snow Co.**, 6200 Harvard Ave., Cleveland 5, Ohio.

For More Details Circle No. 431—Page 55

Industrial Equipment

Eight-page brochure DO23 "Looking Ahead," explains company's research and development activities for improving its present line and producing more versatile machinery.—**Caterpillar Tractor Co.**, Advertising Div., Peoria, Ill.

For More Details Circle No. 432—Page 55

Shell Core Machine

Folder contains diagrams and description of company's shell core machine. It includes photographs of hand and air-operated models, cores which can be produced with this machine, and types of coreboxes which can be used.—**A. C. Chris Co.**, 1737 W. 91st St., Chicago 20, Ill.

For More Details Circle No. 433—Page 55

Square Head Cylinders

Bulletin SH-6-60 describes company's high-pressure, square head cylinders. The booklet offers general and technical information, model and mounting dimensions, and specifications for this interchangeable cylinder. — **Tomkins-Johnson Co.**, Jackson, Mich.

For More Details Circle No. 434—Page 55

Power Distribution

Bulletin GEA-7139 outlines principles of planning industrial power distribution systems. Its 48 pages cover choice of voltages, short circuit calculations, protective relaying, selection of unit substations, power factor corrections, and grounding.—**General Electric Co.**, Schenectady 5, N. Y.

For More Details Circle No. 435—Page 55

Core Binders

Booklet D-17-14B explains corn-base, baked strength binder. A series of charts shows green compression, sag resistance, overhang strength, and bakeability of cores with various ratios of the binder and core oil.—**Corn Products Sales Co.**, 10 E. 56th St., New York 22, N. Y.

For More Details Circle No. 436—Page 55

The Original CO_2 Binder . . .
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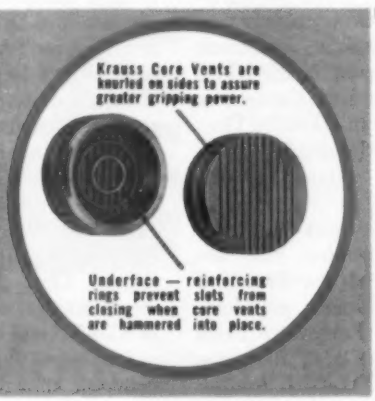
Krauss Core Vents are knurled on sides to assure greater gripping power.
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Circle 625 on Page 55

Nonferrous Foundrymen

Plan Education-Promotion Program

By ROBERT H. HERRMANN
Associate Editor

ELMER G. BRUMUND JR.
President

DAN A. MITCHELL
First Vice President

LAWRENCE J. ANDRES
Second Vice President

● BOARD of directors of the Non-Ferrous Founders' Society at its annual meeting Oct. 12-15 at Grove Park Inn, Asheville, N. C., approved publication and distribution of a book on design, purchase, and use of copper-base alloy castings. M. E. Nevins, retiring president of the society, called this one of the most significant steps which ever has been taken by NFFS.

The book is to form the basis for an educational-promotional program to increase the use of copper, brass, and bronze castings. A series of talks also will be prepared for NFFS members on new processes and developments in the industry. Additional talks on the advantages and uses of copper-base alloy castings will be prepared for presentation to schools and technical and engineering groups. The book and the talks are being prepared by the NFFS technical consultant Dr. R. A. Flinn, University of Michigan.

Chester K. Faunt, president, Faunt Foundry Co., Chicago, was presented the society's Distinguished Service Award for his contributions to the advancement of the industry. The citation was read by W. L. Leopold, Northern Bronze Corp., Philadelphia, a member of the awards committee. Because Mr. Faunt was absent, actual presentation of the award, a cast bronze plaque on black walnut, was made at the Oct. 27 meeting of the NFFS Chicago Management Group by H. A. White, Smeeth-Harwood Div., Capital Brass & Aluminum Foundry Co., Chicago, national awards chairman.

Officers and Directors — Officers elected for the coming year are Elmer G. Brumund Jr., Brumund Foundry Inc., Chicago, president; Dan A. Mitchell, Progressive Brass Mfg. Co., Tulsa, Okla., first vice president, and Lawrence J. Andres, Lawran Foundry Co., Milwaukee, second vice president.

New directors elected for three-year terms are C. O. Eilertson, Boston Pattern Works, Norwood, Mass.; J. W. Horner, Slack-Horner Brass Mfg. Co., Longmont, Colo., and C. T. Koehler, Hamilton Brass & Aluminum Castings Co., Hamilton, Ohio.

E. W. Horlebein, Gibson & Kirk Co., Baltimore, was elected a director-at-large. H. W. White was re-elected a director-at-large. John C. Emery Jr., Racine Foundry & Mfg. Co., Detroit, was appointed a national director by incoming President Brumund to fill an unexpired term.

Herbert F. Scobie, executive secretary, continues as secretary-treasurer. Mrs. Phyllis Stebbings continues in the capacity of assistant secretary-treasurer.

The technical sessions were started with presentation of a paper on the **Nature, Selection and Application of Copper-base Alloys**, by Dr. Flinn. He described the atomic and crystalline structure of copper. Its ductility is due to its face-centered cubic structure and is relatively unaffected by an alloying element which goes into solid solution.

In some cases alloying elements form a precipitate, and these two-phase alloys have less ductility but are stronger. Atom orientation in these alloys forms a body-centered cubic structure. Electrical and thermal conductivity are related and are higher in the more ductile alloys.

New Ideas in Risering and Solidification, also was presented by Dr. Flinn. He described work done by the Research Committee, Brass and Bronze Div., American Foundrymen's Society, on pressure tightness of 85-5-5-5 and other alloys.

Purpose of the work is to develop common knowledge on the various

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Circle 587 on Page 55

alloys to avoid disagreement among foundrymen, thus losing confidence of designers. Another purpose is to develop confidence in castings that will do a job so that designers will not place too much emphasis on test bar properties in writing specifications.

Five speakers participated in a panel discussion on customer service.

Initial Contact, by W. O. Larson, Grafton Foundry Co., Grafton, Ohio. Determine first the type of business you want and the type of foundry equipment necessary to do the work. Names of prospective customers can be found in directories of manufacturers, want ads and financial pages of newspapers, society technical bulletins, and from tips passed on to your purchasing agent by salesmen.

In contacting customers, you need perseverance, and the prospective customer needs money. Get a credit report. Offer quality and service; don't cut the price.

Engineering, by J. D. Claffey, Non-Ferrous Casting Co., Dayton, Ohio. Good engineering and customer service are a foundry's most important tools. Bring a customer into your foundry and show him what is involved in patterns and foundry production techniques for his job. Discuss pattern and corebox equipment and the selection of alloys. Help him with design problems.

Quotations, by N. W. Meloon Jr., Meloon Bronze Foundry Inc., Syracuse, N. Y. Prepare quotations carefully. Do not make mistakes, and do not change quotations once they are made. Also decide with the customer who is responsible for loss or damage to pattern equipment.

Samples and Production, by C. O. Eilertson, Boston Pattern Works, Norwood, Mass. Foundrymen should insist that sample castings be supplied to customers for approval for each new order or revised pattern. Mistakes and misunderstandings thereby are reduced and better relations are developed with the customer.

Complaints and Follow-up, by E. T. Korten, Reliable Castings Corp., Cincinnati. Keep a record card on each casting, listing flask size, gating, chilling procedure, type of core, production rate, alloy, pouring temperature, casting defects encountered, if any, and corrective action taken. Also list the name of the molder who did the job best. Such a record is excellent reference for reorders and for handling complaints if they arise.

Many complaints can be avoided if sample castings are submitted to the customer. If complaints do arise, handle them by telephone.

A second panel discussion featured talks on mechanization.

Is Mechanization Practical for the Small Foundry? by Jeff A. Westover, Westover Corp., Milwaukee. Yes. It can lower cost and increase production, improve casting quality, solve a scarce labor problem, and improve working conditions. Be careful, however, of overmechanization or the wrong kind of mechanization.

Plan a layout with properly scaled schematic drawings. Compare cost of present production methods with the proposed mechanized method. It is necessary to have agreement among most people in the foundry to make a system work properly.

Medium Size Job Shop Problems, by J. W. Horner, Slack-Horner Brass Mfg. Co., Longmont, Colo. Foundrymen must overcome three major problems in equipment acquisition: 1. Financing its purchase. Study the advantages and disadvantages of using cash, the suppliers payment plan, a bank loan, or selling stock in the foundry.

2. Determining usefulness of the equipment. Get an expert's opinion. Will the equipment be useful in an all-round program? Will it save labor, increase production, improve casting quality? 3. Making the equipment earn its way. Train workers to operate, use, and maintain the equipment. Keep it busy. Increase your castings selling program.

Mechanizing the Production Shop, by Jack Bodine, Bodine Pattern & Foundry Co., St. Louis. The degree of mechanization is dictated by the casting. Generally, mechanization is practical if the casting is not too complicated and if production runs are at least one day's molding.

Production capacity of all departments must be considered when mechanizing. Bottlenecks restrict total foundry production. Remember, too, overhead cost and break-even point are raised in a mechanized foundry.

One point brought out in the discussion period is that equipment leasing programs generally are costly. Also, the government may frown on them as tax dodging devices.

Business Analysis & Profit Evaluation, by John E. Graf, Mansfield Brass & Aluminum Corp., Mansfield, Ohio. A few general statements can be reported from this confidential study. Within the study period, the percentage of labor cost to total cost decreased and the percentage of overhead cost increased.

The overhead increase is attributed to more money being spent on

Chester K. Faunt, left, receives the NFFS Distinguished Service Award from H. A. White, Awards Committee chairman. Mr. Faunt was active in the formation of the national society, and was its first president

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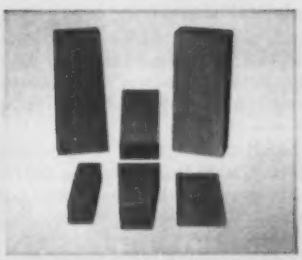
CARBON BLOCKS—Provide long refractory life in the cupola.



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1. Provides more efficient mechanized handling for several different jobs.
2. Operates fast and effectively in close quarters.
3. Operator efficiency sustained during the full shift because of easy operation.
4. Maintenance is low in spite of hard usage.

Brighton Electric Steel Casting Company, Beaver Falls, Pa., makes piercer points for the seamless steel tubing industry, and has earned a fine reputation for uniform high quality and precision workmanship in this specialized field. Its decision to acquire a Model H-25 "PAYLOADER" has proved to be a wise one. This tractor-shovel has brought new efficiencies to their overall operation since it took over several sand-handling and castings-handling duties.

Efficient and Reliable. Foundry Foreman, Thomas Gillingham, says, "The H-25 'PAYLOADER' has many features that definitely increase foundry efficiency. One of these is close-area maneuverability. The operators claim ease of operation with accurate control of material load. It has rugged construction that stands up continuously under rough working conditions with simple maintenance."

Superior Mechanical Features. Speed, capacity, maneuverability and ease of operation are combined in the H-25 for big production all day long — thanks to 2,500-lb. operating capacity, power-shift transmission, torque converter drive, power-steering, power-transfer differential and fast, powerful hydraulic bucket control.

A Size for Every Job. For any bulk-handling job, indoors or outdoors, there is a *proven* "PAYLOADER" — up to 12,000 lbs. operating capacity. A nearby Hough Distributor is ready to show you how a "PAYLOADER" can "ease the profit squeeze". Return the coupon, or write:

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equipment, liberalized depreciation policies, increased taxes, and increased fringe benefits in labor contracts.

Considering total cost, if a foundry with a 4 per cent profit margin on sales before taxes can make a $1000 cost saving, it will achieve the same profit result as obtaining $25,000 in new business.

The Cast Bronze Bearing Institute, a product group of the Non-Ferrous Founders' Society, held its annual meeting Oct. 12 at Grove Park Inn. An industry educational program was planned, research authorized, and officers elected.

Main point in the educational program will be the offering of short courses in bearing design and application at a group of colleges. Research on hydrostatic lubrication of bearings will be carried on at the Franklin Institute, Philadelphia.

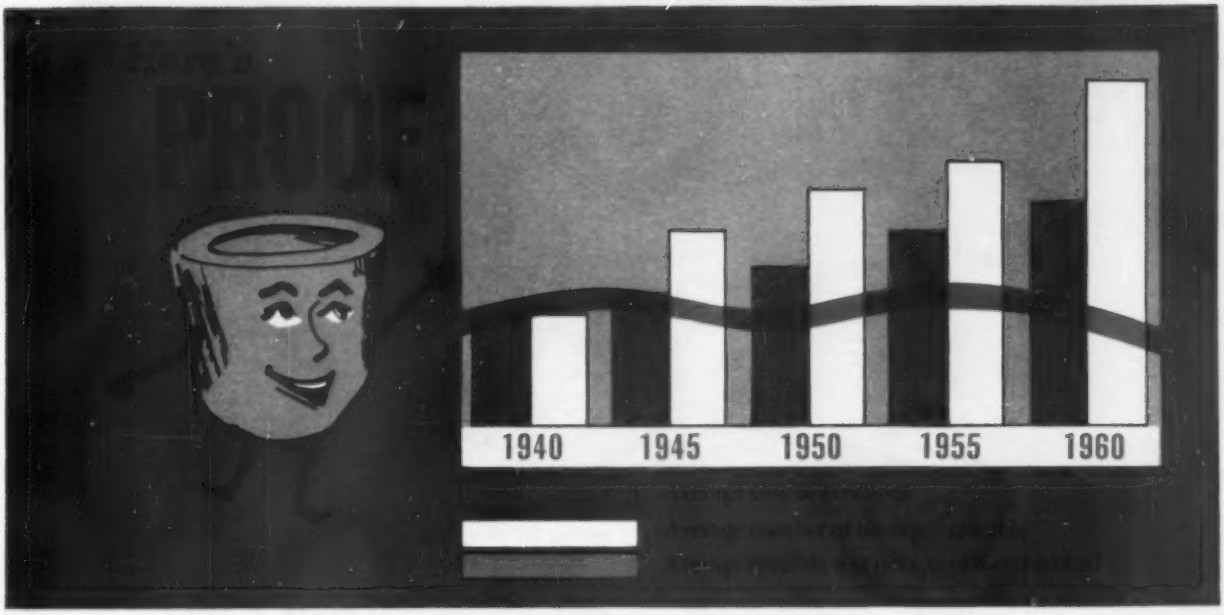
New officers are: Carter N. Paden Jr., Moccasin Bushing Co., Chattanooga, Tenn., president; A. G. Eberle, Renewal Service Inc., Philadelphia, vice president, and Raymond O. Oyler, Bunting Brass & Bronze Co., Toledo, Ohio, secretary-treasurer.

Directors for a 3-year term are: Mr. Oyler and John Mitchell, Markey Bronze Bushing Co., Delta, Ohio. W. H. Crossman, Randall Graphite Bearings Inc., Lima, Ohio, retiring president, continues as a director for one year.

The 1961 annual meetings of the society and the institute will be held Sept. 18-21 at Shawnee Inn, Shawnee-on-Delaware, Pa.

"Will some one please remove this casting?"

. . . per ton of metal melted— CRUCIBLE COST is the SAME as it was in 1940



During the past twenty years the cost of everything has gone up—and crucibles are no exception. BUT—because of constant research on the part of crucible manufacturers, and resultant improvement, crucibles last much longer today than they did twenty years ago. They deliver *more heats*—and *bigger ones!*

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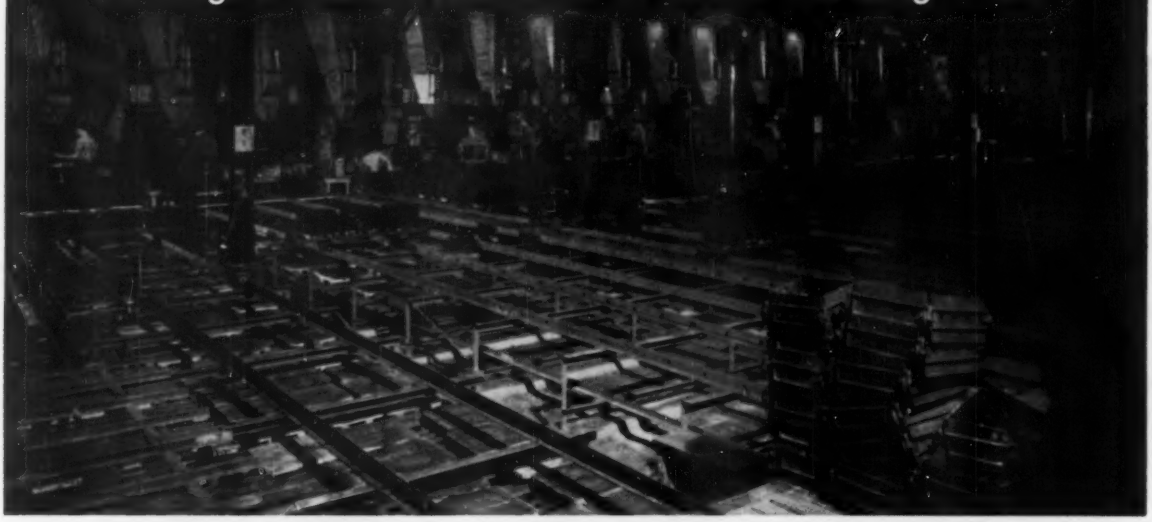
Circle 629 on Page 55

Newaygo Engineering Company — Leaders in

PALLET LINE SYSTEMS OF MOLD HANDLING

for Higher Mold Production at Lower Molding Costs!



As of October, 1959, heavy duty foundry installations in operation total close to TEN THOUSAND LINEAL FEET of Newaygo Pallet Line Systems, consisting of top set out track, automatic mold discharge, and underneath car return, — operating approximately 5,600 Pallet Cars; — which, using average rates of production for molders using these lines and cars, means that these Pallet Line Systems are producing an average of 42,500 molds per working day, for approximately 10,200,000 molds per year!

Projecting the average amount of metal poured in molds by these systems, around 1,200,000 pounds of castings are produced per day, or approximately 300,000,000 pounds or 150,000 net tons of castings per year.

One foundry reports the outstanding performance of Newaygo's Pallet Line System by averaging 450 molds per 7½-hour day per man, using a 14" x 16" x 12" deep mold. This yields a mold per minute per man, and each man is making the complete mold in snap flasks and setting his own cores.

FOUNDRY Magazine's October, 1959 issue established a base of 100% for purchases of foundry equipment during the 1947-49 period, and reported the growth index of 154% for the first seven months of 1959 for all producers of Foundry equipment. *Newaygo's per cent increase for the same period is 224%,* — another evidence of leadership as designers, manufacturers and installers of complete sand handling systems and foundry automation equipment.

Shown above is a view from the pouring floor of a 19-station midwest steel foundry, showing specially designed molding hoppers of Stainclad Steel with air-operated gates. Also shown is the mold storage end of the Pallet Car set-out track system. Molds are handled on pallet cars and are automatically dumped at end of lines into a vibrating pan conveyor. Pallet Cars and boards are automatically returned on an underneath track system.

The presentation of "NEWAYGO PALLET LINE SYSTEMS FOR MOLD HANDLING" is yours for the asking, in a 16mm, 25-minute MOVIE, which shows many types of Pallet Line installations in foundries.

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Around the Country

NEWS REPORTS FROM

Detroit . . . Boston . . . Philadelphia . . . Chicago . . . Pittsburgh

Chicago— The Chicago Undergraduate Division, University of Illinois, Navy Pier, has awarded the 1960 Robert E. Kennedy Scholarships to Paul P. Loeffel and Robert A. Kartman, both juniors in mechanical engineering at the school. The presentations were made at the monthly meeting of the Chicago Chapter, American Foundrymen's Society, Nov. 7.

Another ceremony at the Nov. 7 chapter meeting was the awarding of Foundry Educational Foundation scholarships to three mechanical engineering juniors at Navy Pier. The recipients were Donald A. Dudle, Thomas H. Sytko, Raymond W. Wakefield.

The Robert E. Kennedy Scholarship Fund was established in 1954 by the Chicago Chapter, AFS, as a tribute to and an expression of affection for its long-time member who had devoted his life to educational aspects of the foundry industry. Started with a $5000 endowment, the fund now exceeds $7600. It is administered by the University of Illinois and its income is used to make available annually scholarships "to the student selected for that honor on the basis of character, ability, interest in work related to the foundry industry, and financial need." In seven years, 15 scholarships have been awarded with the grants totaling over $1300.

The late Mr. Kennedy was well known for the enthusiasm and devotion with which he served the foundry industry through the AFS and his years of teaching and inspiring leadership among his students.

An alumnus of the University of Illinois, with degree of B.S. in Vocational Education, Mr. Kennedy was a member of its foundry teaching staff from 1910 to 1921. Beginning in 1921 he served as assistant secretary of the American Foundrymen's Association, in 1924 he was made technical secretary, and in 1943 he was elected secretary. He retired in 1945. In the summer of 1946 when the University of Illinois was establishing its Chicago Undergraduate Division to accommodate increased enrollment sought by veterans of World War II, Bob Kennedy was given the assignment of organizing and setting up the foundry and pattern course. He continued on as professor in charge of the foundry and pattern laboratory until retirement in 1953. He died in Westville, Ind., Aug. 7, 1955.

SAFETY AWARD: One million hours of work without a disabling accident was achieved on Sept. 19 by the works engineering staff, Cleveland works, Aluminum Co. of America. For their record, the group was awarded a cast aluminum plaque. Shown above them is a banner which was hung across the main entrance to the plant to recognize the feat

Detroit— A striking exhibit sponsored by suppliers of malleable iron castings was presented during the National Automobile Show here in Cobo Hall, Oct. 15-23. It was intended to demonstrate the important contributions being made to automotive engineering by the malleable iron industry.

The exhibit included a life-size cutout of an automobile, with an array of malleable castings suspended in their approximate locations in the car. Among these parts was a crankshaft, surrounded by other engine components—rocker arms, fan pulley hub, crankshaft sprocket, and engine brackets. On the perimeter of the engine, a malleable iron steering gear housing, a torsion bar anchor housing, and several other suspension system parts were displayed.

Moving back along the drive train, a nest of malleable iron transmission parts, gears, stator supports, drums—were shown leading into the drive shaft, which was connected at both ends by malleable iron yokes. The axle assembly of the

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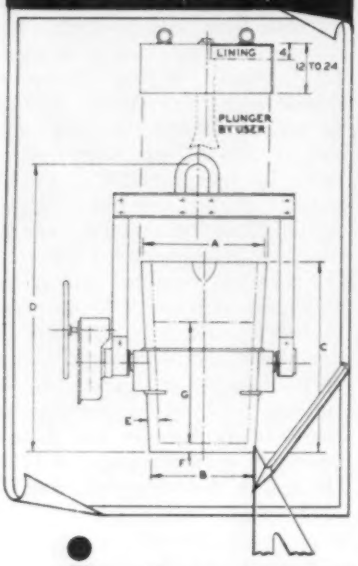

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typical automobile also included malleable iron castings, the differential carrier and case, bearing caps, and wheel hubs being shown.

In another panel, five typical malleable castings were subjected to mock tests which demonstrated important mechanical properties of the material, including impact resistance, ductility, resistance to torsion-

al stresses, machinability, and toughness.

The display was sponsored by Albion Malleable Iron Co., Albion, Mich.; Auto Specialties Mfg. Co., St. Joseph, Mich.; Central Foundry Div., General Motors Corp., Saginaw, Mich.; Dayton Malleable Iron Co., Dayton, Ohio; National Malleable & Steel Castings Co., Cleveland, and Wagner Castings Co., Decatur, Ill.

Philadelphia— Castings demand is off as seasonal influences become more pronounced. Fall business in gray iron was sustained at around 60 per cent of normal capacity into late October. Since then there has been a slight tapering.

Demand for steel, malleable, and nonferrous castings has followed much the same pattern and is expected to continue to do so over the year's end.

In gray iron, printing and drug processing machinery requirements are holding fairly well. Also, auto die work is fair, although there has not been the anticipated surge.

Captive shops as well as independent foundries reflect this general lag. Schedules of three to four days a week appear to be the rule. Delivery promises on gray iron range from one to two weeks.

Lack of heavy industrial equipment work is materially retarding steel casting production. Some shops were able to get up to five days a week for a time but are now down to two and three days. Few delivery promises extend more than five weeks, which is rather poor, considering the processing which is involved.

Malleable shops report continued dullness in building and electrical hardware. Consumers of pipe fittings appear well stocked. Business is spotty with the brass shops, a number operating only two or three days a week. Aluminum foundries are working four to five days, although backlogs remain small.

Pittsburgh— Depression hit the foundry industry at midyear, when steelmaking went into a slump, and there has been no improvement since. Foundrymen expect no upturn until the mills—their biggest customers—start operating at more nearly normal rates and stop liquidating their inventories of castings. This may not happen until the first quarter of next year.

Backlogs at steel foundries are so small that company officials have to check Friday's mail before deciding how many days they will operate in the following week. In most cases, they are working three or four days with reduced crews—producing at 40 to 50 per cent of capacity. Prices are said to be "reasonably stable."

Some gray iron foundries, thanks to diversified markets, are doing a little bit better than the steel shops. Demand from manufacturers of industrial furnaces and packaging machinery has been surprisingly good in recent weeks. Nevertheless, it's hard to keep a good balance between work for big and small machines. At one firm, the solution has been to work three days a week on small jobs and four days on rollovers.

Despite reduced earnings, foundrymen intend to modernize their equipment. Most of them feel that it's the only way they can stay competitive. As one firm put it, "We're very much interested in buying some big rollovers to match the ones we have in our shop. We

can't get molders, so we have to mount everything."

Pig iron sales have been depressed for months, and there is no likelihood of improvement until January. Poor demand reflects reduced activity in foundries supplying steel mills, agricultural equipment producers, and the plumbing industry, whose sales declined when housing starts fell off.

Reliance Steel Casting Co., one of the leading steel foundries in this area for 50 years, is being liquidated. The firm sustained heavy losses last summer, when a fire destroyed a section of the plant containing molding and pouring floors.

Boston— A depressed second half cooled off gray iron cupolas, bringing production 15-20 per cent under 1959 volume. With few exceptions, malleable, steel, and nonferrous shops will pour less tonnage. Fourth quarter has been disappointing, and backlogs will be small entering 1961.

Slight improvement in January is forecast without much change in buying policy. Castings users are expected to buy for inventory until foundries no longer can make early delivery.

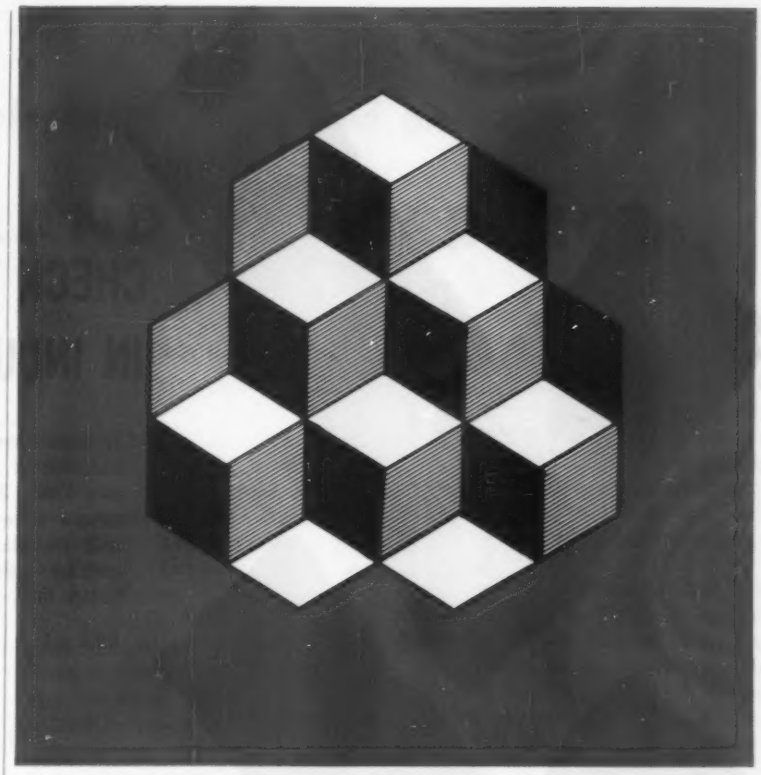
Machine tool builders booked heavier orders during and since the Machine Tool Show, and castings inquiries are beginning to reach foundries. However, textile machining shops, making large shipments against foreign orders, may slow down in early 1961.

Despite decline in volume, many jobbing shops in New England have installed new equipment and modernized during the year. Sand-handling and cleaning installations predominate, but some foundries have added annealing capacity.

Brass foundries look to shipbuilding for a substantial increase in orders. New England shipyards, including naval installations, have heavy orders for which brass and bronze castings will be needed.

Aluminum and diecasting shop operations have been steady for some months although well below capacity.

Howe Scale Co., Rutland, Vt., has been taken over by Canadian Fairbanks-Morse Co., Montreal, and will continue as a subsidiary, with Fairbanks-Morse using some of the Howe designs in Canada.



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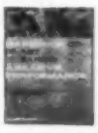

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STEEL ABRASIVES

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But these ideas barely scratch the surface. For the greatest innovation has been the Inductotherm concept of service. Not just fast repairs and overnight replacement of parts (even M-G sets) . . . but a basic concept: *Inductotherm is out to fit induction melting to your needs.* We will make every possible effort to improve our equipment and the induction technique, never asking you to trim your requirements to the limitations of our equipment.

If you'd like more information on Inductotherm furnaces, write for Bulletin 70. But, for a taste of Inductotherm service, ask to have an engineer call. Inductotherm Corporation, 412 Illinois Avenue, Delanco, New Jersey.

INDUCTOTHERM

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New Foundry Developments Discussed at

NEW ENGLAND CONFERENCE

By EDWIN BREMER
Metallurgical Editor

● TWENTIETH New England Regional Foundry Conference sponsored by 12 organizations was held at Kresge Auditorium, Massachusetts Institute of Technology, Cambridge, Mass., Oct. 14-15.

Sponsors included the New England Chapter of AFS, Massachusetts Institute of Technology, Northeastern University, Tufts University, and several state foundrymen's groups.

Conference was opened by Chairman Ahti A. Erkkinen, Fremont Casting Co., Worcester, Mass., and those in attendance were welcomed by Dean Gordon Brown, dean of engineering, MIT.

Opening technical session dealt with the foundry situation in Europe and in Mexico and Latin America. Lester B. Knight, Lester B. Knight & Associates, Chicago, spoke on **Developments in European Foundries**, and stated that there are approximately 5000 foundries in western Europe, and 1500 to 1600 of them have more than 100 employees. Considerable mechanization is used in the foundries, and in many cases it appears that they are overmechanized.

In West Germany there is a tendency toward using special alloys for special purposes, and some foundries use as many as 20 compositions which, in the opinion of the speaker, were not always necessary. Part of the reason for the different compositions is the high cost of pig iron and coke, and methods were developed to handle inferior materials to produce quality castings.

Mr. Knight mentioned that more electric induction melting furnaces in the line and middle frequency types are being employed which results in good melting control. He also stated that foundry equipment manufacturers in Germany have a two-year backlog of orders, mostly foreign. Mr. Knight said there is an increasing flow of patterns and tool components from Germany to this country due to the large wage differential between $1.25 and $3.25 per hour.

The speaker believes that European foundrymen are ahead of those in this country in metallurgy and handling molten metals, but behind in many other areas.

Industrialization of Mexico and Latin America was discussed by Lawrence J. Litalien, Waterbury Farrel Foundry & Machine Div., Textron Co., Waterbury, Conn. He pointed out that Mexico is the leader of South American countries in industrial expansion. Brazil appears to be the largest steel producer. Due to the many political changes in Argentina, industrial expansion there is being held back. Chile relies mainly on imports, and Peru is endeavoring to expand its industries.

Mr. Litalien said that the foundry industry in this country could benefit indirectly through production of castings for machines, etc., which are exported to Latin America, provided the costs are in line with competition from other countries. To do that management and labor must join in promoting better efficiency.

A panel of speakers including George Koren, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago, L. G. Probst, National Engineering Co., Chicago, and O. H. Kastens, Newaygo Engineering Co., Newaygo, Mich., spoke on **Foundry Equipment.**

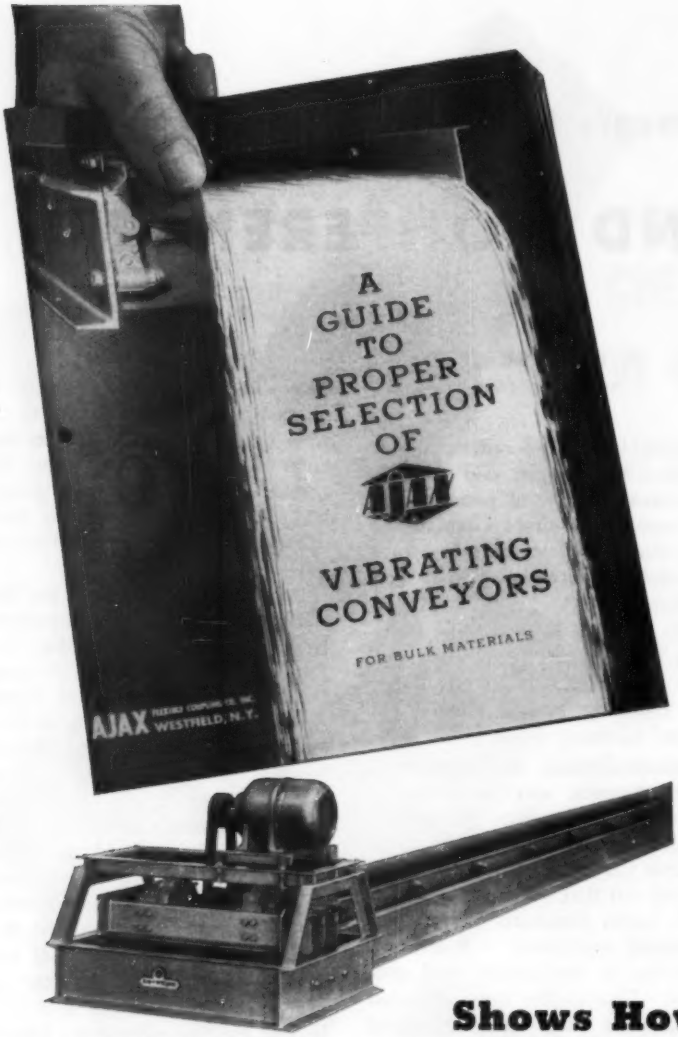
Mr. Koren said that castings production in this country is about 40 tons per man-year, compared with 20 to 30 tons for European workers, and this was attributed to the wide use of molding machines and other equipment. Mr. Probst discussed sand preparation equipment, and Mr. Kastens spoke on mold conveyors with special emphasis on the pallet car type.

Production of Ductile Cast Iron was discussed by Lewis Greenslade Jr., Brown & Sharpe Mfg. Co., Providence, R. I.; Frank Harness, Ductile Iron Inc., Stratford, Conn.; Arthur Avedesian, Taylor & Fenn Co., Windsor, Conn., and Andrew Jenckes, J. S. White Co., Pawtucket, R. I.

Mr. Greenslade said that by designing on the basis of the higher physical properties of ductile iron, it is possible to produce machine tool castings at a lower cost than for gray iron design. Small castings are produced from 100 per cent pig iron charges melted in a 1000-lb capacity reverberatory furnace. Molten metal is transferred to an electric arc furnace where it is superheated to 3000° F. Iron is inoculated by pouring it on the magnesium alloy in the ladle. Returns from this iron are used as the raw material in the cupola for making large castings.

Mr. Harness said that his firm's foundry melts iron in two 1000-lb reverberatory furnaces in 25-minute cycles. Metal is tapped at 2800° F for castings weighing from a few ounces to 500 lb, and magnesium alloy and ferrosilicon are added to the metal as it flows from the furnace into the ladle. Raw material is pig iron and shop returns. Castings are heat treated in two pit-type furnaces. Microstructure checks are employed to insure quality of the product.

A basic-lined cupola for large heats and a reverberatory furnace for small heats are employed in Mr.



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Avedesian's foundry. Charges are composed of returns and steel scrap. Slugs cast from every ladle are fractured and examined to insure absence of flake graphite. Test bars for physical properties are cast from every third ladle, and chemical analyses are made on every fifth ladle of iron.

After experience with small cupolas Mr. Jenckes said that he turned to a 1000-lb capacity reverberatory furnace. Charges are 50 per cent returns and 50 per cent pig iron, and castings made vary from 1 oz to 1500 lb in weight. Molten iron is inoculated by treating 700 lb with magnesium alloy and 300 lb with ferrosilicon, and then mixing the two batches of treated metal.

In discussing **Aluminum Bronzes**, Norman Birch, National Bearing Div., American Brake Shoe Co., Meadville, Pa., pointed out that the alloys of copper and aluminum provide high strength and corrosion resistance. Additionally the physical properties can be improved by heat treatment. Alloys are poured at from 2000 to 2200° F, and if there is a tendency toward oxide skins or "scruff," the sand is too tight or too moist. Preferable gating is through a small choke into the top of a riser which gates into the lowest part of the casting cavity.

High Manganese Alloy

One series of new alloys in the aluminum bronze classification is tradenamed Superston, and contains a high manganese content—one composition showing 75 Cu, 8 Al, 3 Fe, 2 Ni, and 12 Mn. As-cast minimum properties show 90,000 psi tensile, 40,000 psi yield, 20 per cent elongation and 180 Brinell hardness. Properties after heat treatment are 120,000 psi tensile, 65,000 psi yield, elongation 8 per cent and 240 Brinell. The Superston alloys can be poured at temperatures 100 to 150° F lower than pouring temperatures for regular aluminum bronzes.

Robert Scott, Canadian General Electric Co., Toronto, Ont., spoke on **Epoxy Resins in Patterns for the Jobbing Foundry**. The speaker showed a number of slides illustrating the application of epoxy resins to pattern production. He said that in many instances metal

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matchplates could not be beat, and where only one or two castings are to be produced, wood patterns are the most economical.

Victor Rowell, Archer-Daniels-Midland Co., Cleveland, spoke on **New Developments in Binders for Cores and Molds.** Binders which can be cured while the core still is in the box and thus prevent sag and distortion include the sodium silicate-CO_2 process, phenolic resin coated shell sands, air-setting oils activated with an oxidizing agent and catalyst, and the new furan and modified furan resin binders.

The furan binders may be divided into two types—one for large cores which cures by chemical action without application of heat, and the modified type containing some urea which requires heat for hardening, and is used for small cores. With the former type the bench life can be adjusted from a few minutes to nearly an hour, and the cores are stripped from the boxes in a time period of about three to five times the bench life. Cores are ready for use, but in some cases a "light-off" alcohol-base core wash is used. Cores have good high-temperature properties and easy shakeout.

The modified type contains a catalyst which is relatively inert at room temperature and requires heat for activation. This type of resin is liquid, resulting in a wet sand which requires some modification or normal core blowing techniques such as higher air pressures and additional venting. Corebox temperatures may range from 350 to 475° F depending on the resin used. Curing speed is considerably faster than in the case of the regular coated resin shell sands—a matter of seconds rather than minutes.

Since a wet sand mix is used, the cores are solid, and where core sections exceed 1½ in. it may be desirable to improve the internal cure by a short oven bake at 400° F. Shell cores made with phenolic resin coated sand will be economically advantageous where 50 per cent or more of the sand is drained from the box and reused.

The conference closed with a discussion on **Selling Castings in a Buyer's Market** by Everett E. Norton, Norton Associates, Rockland, Conn.

Book Review

Techniques for Marketing New Products, **by Douglas Banning, hard cover, 308 pages, 6 x 9 in., published by McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. Price $6.50.**

Book analyzes merchandising, advertising, and managing the introduction of a new product. Specifically geared to marketing techniques for small businesses, it discusses how to locate new product ideas, figure the chances of success before risking promotion, select the most profitable distribution method, create or supervise an advertising and sales program, comply with federal, state, and local laws, and assure the financial growth of the business.

Instructions on copywriting, printing, mail orders, and sales planning are included. Names and addresses of numerous publications, directories, and agencies are mentioned.

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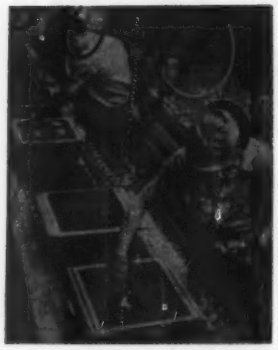

SETTING CORES IN DRAG HALVES as molds are conveyed to next station. Except for core setting and pouring, this new line is completely self-operating for continuous production flow.

Osborn Field Report...

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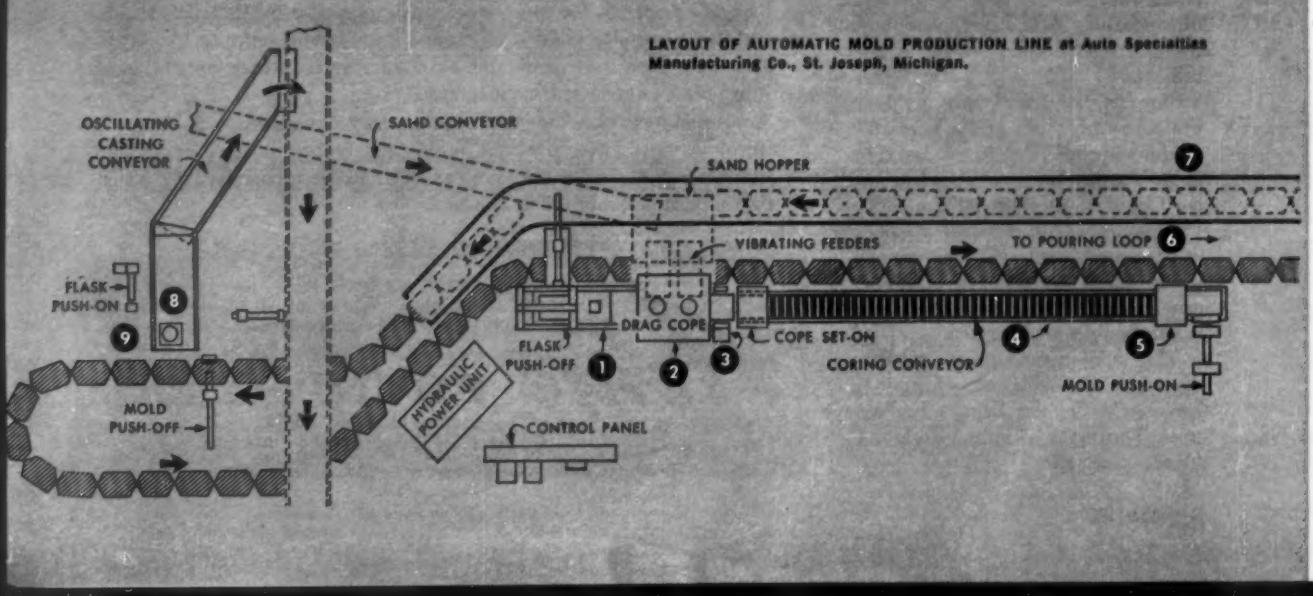
This new automatic molding line at Auto Specialties Manufacturing Co. ranks today as the nation's most productive, dependable molding operation. It features Osborn's Automatic Series "M" Molding Machine plus other Osborn-built automatic equipment for highly efficient mold and flask handling. Requiring only a minimum of manpower, its simplicity enables the new setup to run dependably hour-after-hour...shift-after-shift, turning out a continuous flow of exceptionally high quality castings of close dimensional accuracy and superior surface finish. Net result is that workers like the new line and so does management. It's on-the-job evidence that the *key* to modern foundry *profit* planning is *mechanization.*

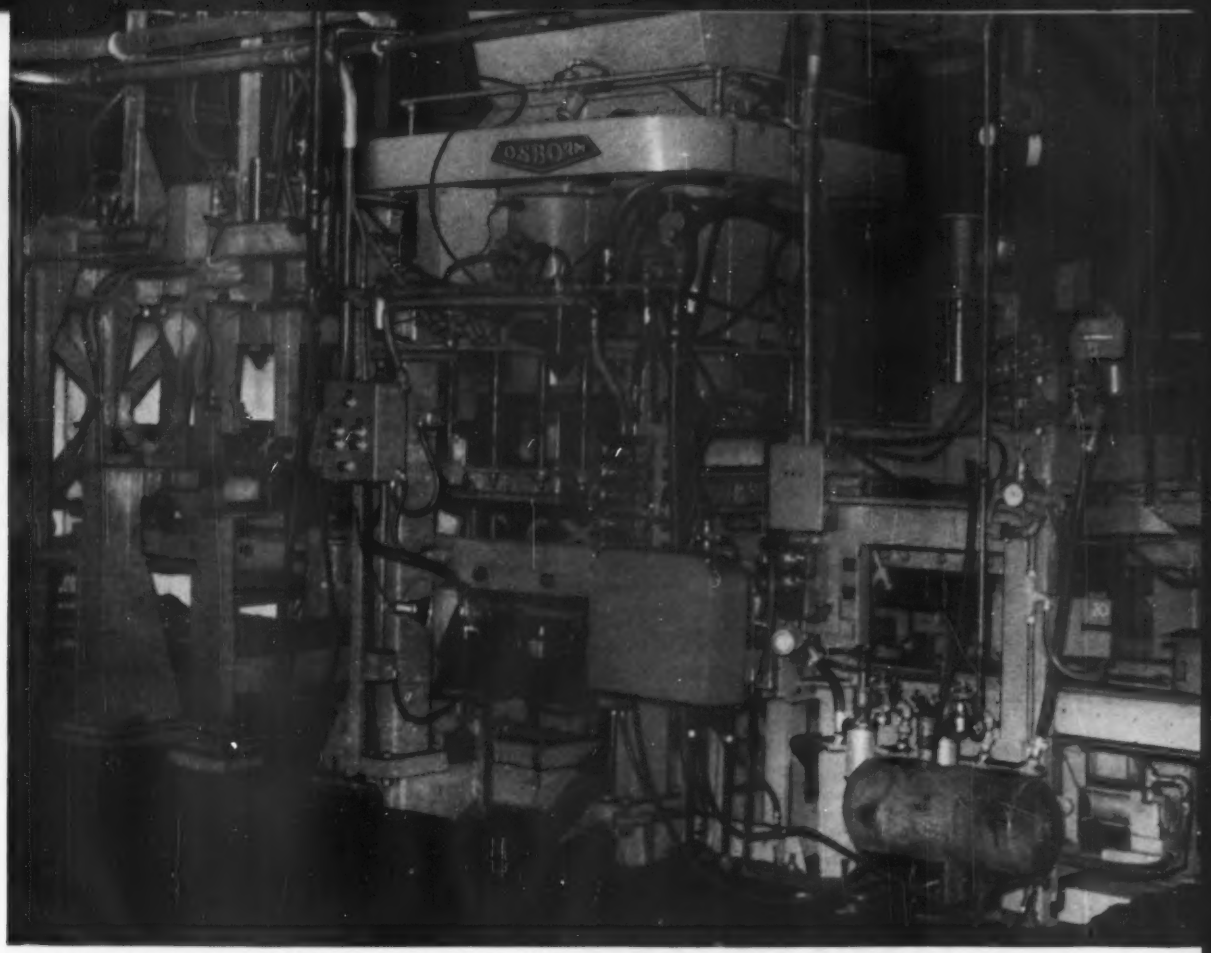
For foundrymen concerned with ways to lower costs...speed production...boost efficiency on short-run or mass production—Osborn's advanced foundry production machinery and methods are well worth checking into. Write for full information.

Osborn equipment at Auto Specialties Mfg. Co. delivers these 6 important benefits: Higher production is achieved with minimum manpower • All jobs carry the same standard rate • Variations in mold types are handled by simply varying number of core setters and pourers • Mold hardness can be changed by simple adjustments • Sand spillage is practically eliminated...reducing "housekeeping" time • No manual lifting...less exposure of workmen to injury.

HERE'S HOW IT WORKS—Assembled flasks are pushed from closed-loop conveyor car line into flask feeder at (1). Cope and drag are automatically separated and positioned in molding machine (2) for blow-fill and squeeze. As mold halves are ejected from molding machine, drag is rolled over at (3). Cores are set at (4) and molds enter closing machine at (5). Pouring is done at (6). Filled flasks move through cooling tunnel (7) to automatic punch-out station at (8). Cycle is completed as empty flasks are returned to conveyor at (9). Flasks used on the line measure 16" x 19" x 8" drag, 8" cope. Molds are rammed to a uniform hardness of 90-97 depending on job requirements.

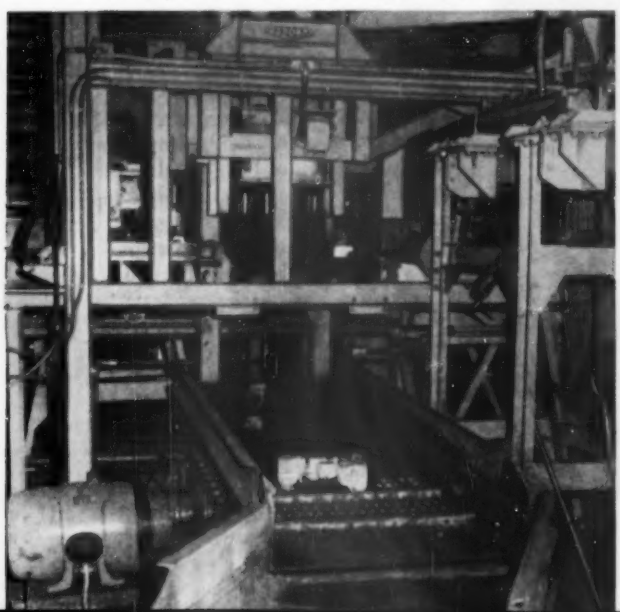
LAYOUT OF AUTOMATIC MOLD PRODUCTION LINE at Auto Specialties Manufacturing Co., St. Joseph, Michigan.





COPE AND DRAG MOLDS ARE RAMMED SIMULTANEOUSLY at a rate well over 300 per hour by Osborn Series "M" Blow-Squeeze Molding Machine on new automated molding line at Auto Specialties Manufacturing Co. Finished half molds are seen moving out of machine at right. Series "M" Molding Machines (available in 3 size ranges) are blow-fill, hydraulic-squeeze units. Entire molding sequence is automatic, on pre-set time cycles. Green sand molds are completed within 12 seconds.

OSBORN AUTOMATIC CASTING PUNCH-OUT EQUIPMENT quickly removes sand and castings . . . brushes flask walls clean . . . and eliminates practically all flask pin and bushing maintenance.



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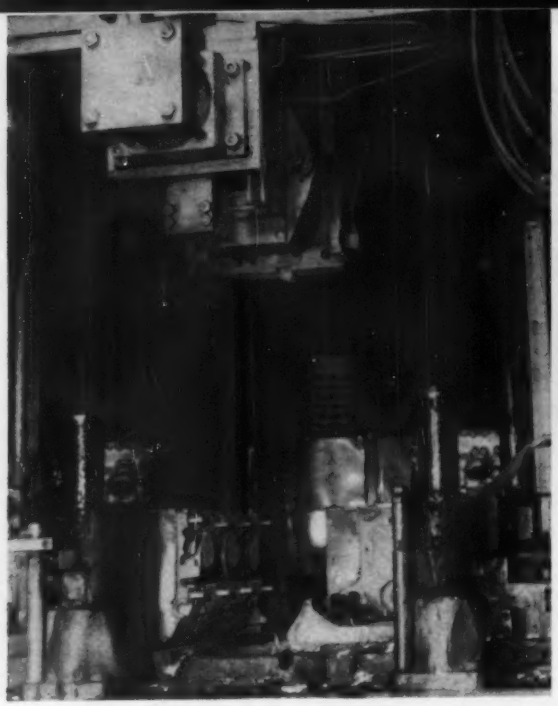

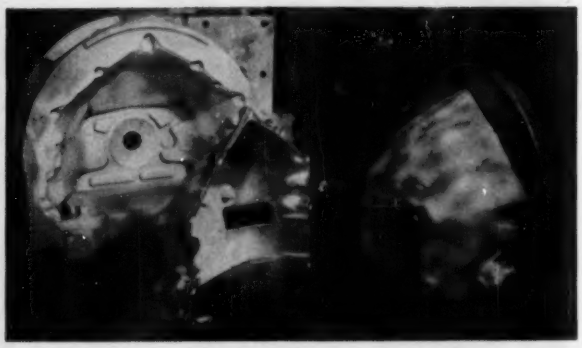

Corvette clutch housing, shown here between two permanent mold halves, is cast of aluminum at GM's Massena foundry. Mold is cast of H-13 die steel

Open mold set for left-hand half of Corvair crank case. Aluminum is forced upward into the mold cavity by low pressures ranging up to 10 psi

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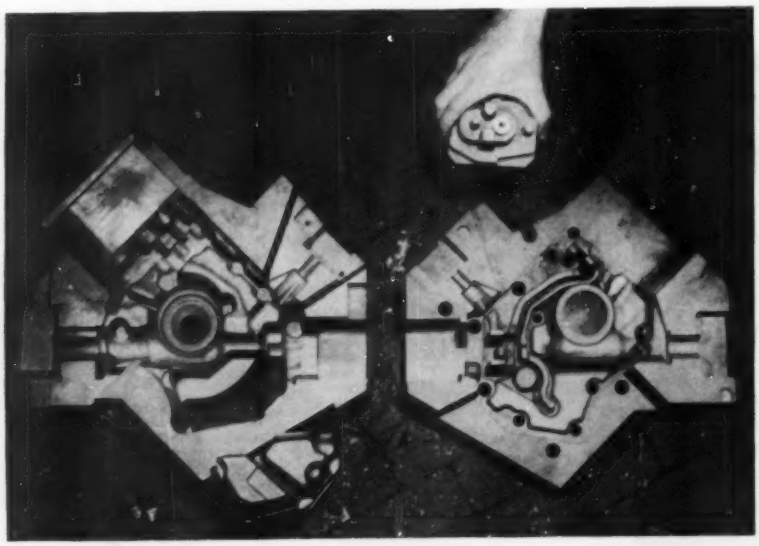
. . . are cast-to-size

● REDUCTION of lead time and cost of labor and material on tooling is of particular importance in the highly competitive automobile industry. Engineers at Chevrolet Motor Division's aluminum foundry in Massena, N. Y., found a way to achieve those aims in permanent molds used to produce aluminum castings for the Corvair engine.

The molds are cast-to-size of H-13 die steel by the Engineered Castings Div., American Brake Shoe Co. The previous experience of Engineered Castings with General Motors' manufacturing development and production divisions on cast-to-size auto body forming dies had led to some preliminary work on cast steel for aluminum permanent molding. As a result, Engineered Castings was chosen to provide the major mold components for the Corvair program.

Conventional Patterns — Conventional wood and plastic pattern equipment is used to produce the permanent mold castings in proprietary molding materials, and special attention is given to gating and risering. Backs of the permanent mold castings are contoured and lightened to save metal, eliminate machining, and provide cooling.

Gates and runners are cast integrally. Metallurgical control is maintained through metal sample analysis on a direct reading spectrometer. Molds normally are annealed



These cast-to-size components make up a permanent mold set for Corvair engine housing

HINES "HI-FLEX" CAST JACKETS

Upon application to the mold, the "Hi-Flex" instantly assumes the exact shape of the mold and automatically adjusts itself to the taper of the mold.

PATENTS PENDING

One of many **HINES** *developments contributing to better foundry production*

- An ingenious pivot-pin arrangement at its four corners gives the "Hi-Flex" a flexibility unmatched by any other jacket on the market.
- Its fit on the mold can easily be changed by replacing corner pins with pins of larger or smaller diameter.
- Replaceable corner pins also permit adjusting the "Hi-Flex" to fit either slip or "Pop-Off" molds.
- Cast of aluminum or iron — jig and fixture built for maximum accuracy.
- End and side castings may be purchased separately. Filleted corner inserts and steel corner protection shields are also available.
- Lengths and widths, 10″ to 30″. Depths, 6″, 8½″, 11″ and 13½″. Special depths available, in half inches.

WRITE FOR CATALOG FOLDER NO. 203

THE HINES FLASK CO.

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HINES FLASKS

Capital Cheers Chief

Crowds everywhere cheer Chief Keokuk and the winning Kemco ticket. Steel men and foundrymen hail Kemco Silvery as the superior form of silicon introduction. They know they can count on Kemco's campaign promise of economy and uniformity. This year, and every year, when they want Silicon . . . they choose KEMCO!

KEMCO SILVERY PIG IRON

SILICON METAL - OTHER FERROALLOYS

Kemco Silvery always melts evenly, handles easily by magnet or count, holds silicon loss to a minimum. Your choice of 60 lb. or 30 lb. pigs or 12½ lb. piglets in regular or alloy analysis for iron and steel production. Send for your copy of the free booklet, "For Lower Costs, Higher Quality Products". Be sure to check the performance of Kemco Silicon Metal in aluminum, too!

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Sales Agent: Miller and Company

332 S. Michigan Avenue, Chicago 4, Illinois
3504 Carew Tower, Cincinnati 2, Ohio
8230 Forsyth Blvd., St. Louis 24, Missouri

to a Brinell hardness of 225. In this condition, H-13 offers 100,000 psi tensile strength and 15 per cent elongation.

At this stage of processing, the steel molds are shipped to a Chevrolet mold source for simple machining on sides, backs, mating faces, and bosses. No Kellering is required and only a minimum of hand working is necessary on the contours. Mold faces may be heat treated by heating to 1850° F and air cooling for maximum hardness in excess of Rockwell C55 or drawn to intermediate hardness of about Rockwell C40.

Refractory Coated — When the molds are ready to be used in production, they are coated with a refractory material. The coating protects the molds, aids in casting release, and can be used to control solidification by the insulating effect of various coating thicknesses.

These molds are used on machines of fairly simple construction. A mold set, hydraulically actuated to open and close, rests over a 750-lb induction furnace and is fed through the bottom by pressures up to 10 psi applied on the bath of molten aluminum alloy 365. Injection temperature is higher than generally used in permanent molding and temperature of the molds ranges between 800 and 850° F. A description of aluminum castings production was presented in the August, 1960, issue of FOUNDRY, Page 57.

The first mold sets were used for producing the left and right-hand crankcase sections, which weigh 16 lb each. Since then, mold sets have been supplied for 18 molding stations on the crankcase line.

Cost Savings—Although no direct cost comparison has been made between cast-to-size H-13 molds and molds Kellered from billets, production experience shows savings can be achieved on groups of identical mold sets. Patterns for castings plus simple machining are less than the cost of a billet plus Keller machining and waste metal.

An additional benefit of the cast molds is the dense metal which always is found near the as-cast surface. Engineering changes are accomplished as easily with one method as the other, but time for tooling, if properly scheduled, can favor the casting method by 20 per cent.

You get thorough blending and tempering

with CLEARFIELD "Revolving Pan" MIXERS

All Clearfield Mixers work on the revolving pan principle, providing a balanced mixing and tempering action. As the pan rotates, centrifugal force keeps *all* of the batch in continual motion, adding to the mixing action of the mullers, agitator and revolving disc. There are no lags.

The mullers of Clearfield Mixers not only revolve on contact with the mixture, but also exert a sliding, twisting action which rubs or "smears" the bond on the sand grains, increases the speed and thoroughness of tempering. These mullers are wide faced and spread far apart to give maximum mulling area per revolution . . . high production is achieved without excessive pan speeds, reducing vibration, prolonging life of the machine.

The patented star-shaped agitator of Clearfield Mixers covers the entire flat surface of the revolving bottom and prevents the material from forming hard cakes or lumps. The agitator is driven by contact with the revolving bottom or the material being mixed. The whirlpool action created by the agitator speeds up the mixing process, promotes clean emptying of the pan.

A double duty disc cuts all the material free from the revolving pan rim at each revolution, turns it over and diverts a continuous stream of material under the mullers. When moved to the discharge position it unloads the complete batch within 15 to 30 seconds! This discharge, in addition to being smooth, rapid and clean, has the important advantage of having an aerating effect because it shoots the sand out over the rim into the hopper in a finely diffused spray, depositing it in a soft fluffy condition ready for use.

There's a size for every job

Clearfield Mixers are available in sizes from 2½-ft. to 9-ft. diameter . . . with capacities per batch ranging from ½ cu. ft. to 40 cu. ft. For details write for free technical bulletins.

CLEARFIELD
MACHINE COMPANY
CLEARFIELD, PENNSYLVANIA, U.S.A.

Circle 639 on Page 55

MASTER PLAN FOR MODERNIZATION

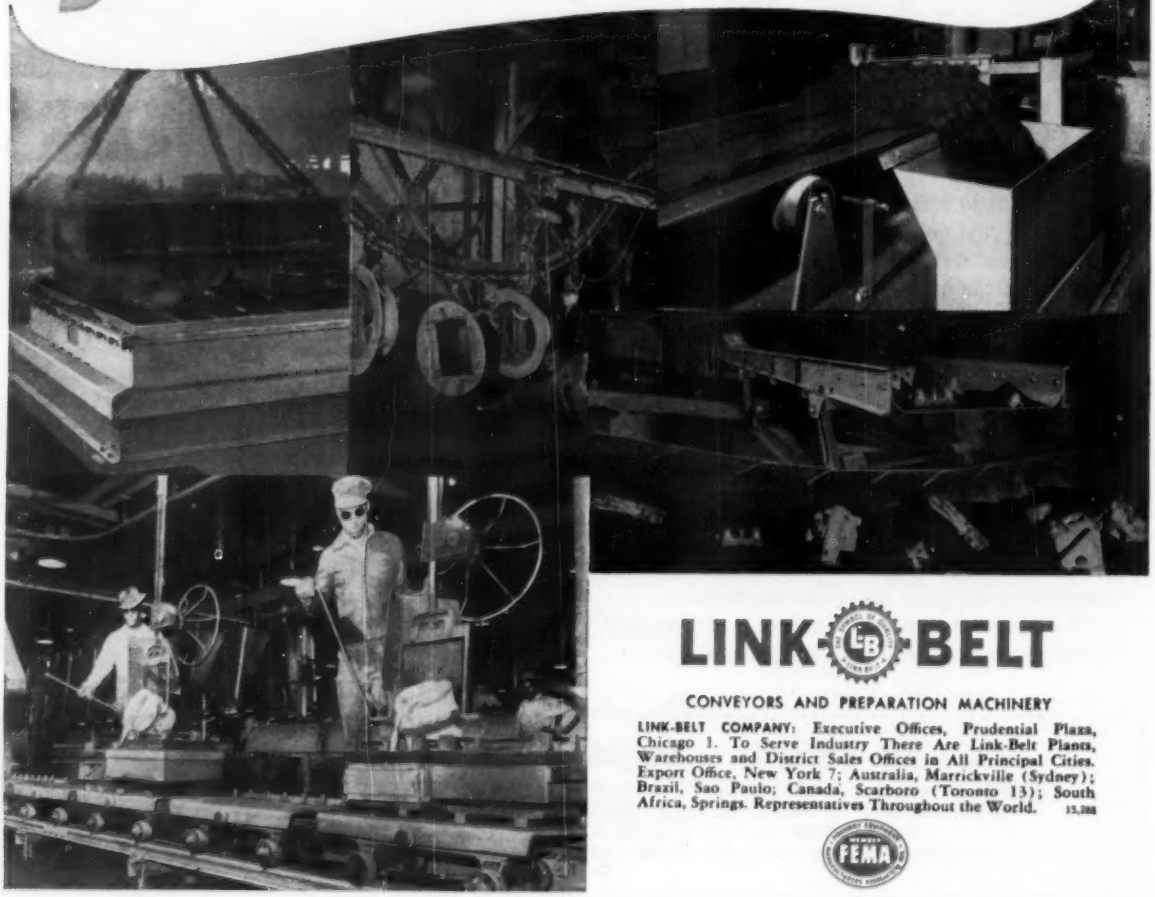
step-by-step mechanization

WITH LINK-BELT EQUIPMENT

MECHANIZATION is the surest way to greater foundry productivity . . . at lower cost. And if budget limitations won't allow a *completely* mechanized system immediately, then a Link-Belt step-by-step program is the answer. Start modernization where you need it most . . . then proceed according to a well-organized plan.

There are two reasons why Link-Belt is *best* qualified to help you plan and carry out a step-by-step improvement program —(1) 50 years' foundry experience. (2) industry's broadest line of conveyors and preparation equipment. Whether it's the handling of sand, cores, molds, castings . . . or a completely integrated system—Link-Belt will provide equipment that results in more efficient operation, lower costs, better working conditions.

Our staff of foundry specialists is available for counsel with you or your consultants. Call your nearest Link-Belt office or write for Book 2423. Ask, too, about our thirty-minute, color-sound film, "Foundry Flexibility." It will be lent on request for viewing by your group.



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LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses and District Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 15.288

Attendance at the conference banquet included approximately 50 ladies

Record Attendance Marks

Northwest Regional Conference

By JACK C. MISKE
Associate Editor

● A RECORD NUMBER of Oregon, Washington, and British Columbia foundrymen met in Vancouver, B. C., for the 11th annual Northwest Regional Conference, Oct. 21-22. Attendance topped 200, including a considerable number of ladies. Sponsors of the meeting were Oregon, Washington, Oregon State College, and British Columbia chapters of the American Foundrymen's Society, with British Columbia Chapter the host.

The program included nine sessions, two luncheons and a dinner, a visit to the Vancouver extrusion plant of Aluminium Co. of Canada, and a dance.

Luncheon speaker on the first day was Dr. R. H. Wright, British Columbia Research Council, University of British Columbia, who spoke on research for peace in the world. On the second day, John Billings, Vancouver Steel Co., presented a talk prepared by J. R. Belyea, of the same company, on **Steelmaking in Hawaii.** At the conference banquet, W. B. Johnson, Aluminium Co. of Canada, discussed **This Wonderful World.** Reports on technical papers follow:

Cast Iron Melting Furnaces in Canada—and Future Trends, by F. W. Kellam, Electro Metallurgical Co. Div., Union Carbide (Canada) Ltd. Many cupolas in Canada are not built properly or maintained adequately. Such common faults as low stacks, lack of gaging, and other deficiencies cause hard or soft iron, inconsistent properties, uneconomical melting, and similar problems. In addition, Canadian iron founders do not pay enough attention to new developments in cupola melting.

Of 301 cupolas installed in Canada (266 in general use), 4 employ balanced blast, 3 hot blast, 15 water cooling, and 8 basic or neutral lining. Other units used to melt iron in Canada include 8 air furnaces melting cold charges, 5 air furnaces duplexing with cupolas, 15 gas or oil-fired furnaces, and 34 electric furnaces of various types.

Regardless of which is used, melting should be under control. This control requires use of the proper equipment and an understanding of cast iron metallurgy. Since cost of melting with various types of furnaces does not vary greatly, choice of a unit should be made on the basis of the type, quantity, and variety of metal desired. The same considerations should govern decisions concerning the use of basic lining, water cooling, hot blast, and carbon lining.

Properties and Production of Ductile Iron for Gearmatic Components, by Robert B. McDonell, McDonell Metal Mfg. Co., and Aubrey S. Tuttle, International Nickel Research & Technical Services Ltd. Presented by Mr. McDonell. Ductile iron fills the gap between cast iron and steel, and a full line of irons is possible, including ferritic, pearlitic, and martensitic. Various strengths are produced, the most popular being the 60-45, which is widely used because of its excellent machinability.

The machinability, ductility, and other properties of ductile iron suit it extremely well for certain applications. Welding still is a problem, but progress on its solution is being made. McDonell Mfg. produces many ductile iron castings for use in Gearmatic Co. products.

The Worm Has Turned, by S. C. Massari, technical director, American Foundrymen's Society. Foundrymen must make their customers know about castings. They have to compete, to take advantage of new processes, and to meet new demands. If foundrymen do not meet the needs of customers, their competitors will. Rendering the great-

est service will render the greatest profits.

The casting industry is old and basic, but its continued existence depends on its development as a scientific process and its application as such. Every foundry must employ trained technologists and must budget for research, which is necessary to keep existing markets, regain some old markets, and find new markets. Castings have not kept up with the growth of the economy.

In the future, rising costs will require better, closer tolerance castings which will reduce machining and finishing. This step will keep castings competitive. The customer will pay a little more for his castings if he can save a lot more on finishing and machining. Selling castings is an engineering job which calls for close technical liaison between foundry and customer.

Use of Calcium Carbide as a Desulfurizer in an Acid-Lined Cupola, by G. Harris, Anthes-Imperial Co. The use of calcium carbide to reduce sulfur in cupola cast iron is not new, but desulfurization has become more important than ever with the advent of ductile iron.

It has been discovered that calcium carbide also increases combustion, thus decreasing the need for coke, which itself carries sulfur. When calcium carbide is introduced through the tuyeres, up to 50 per cent or greater reductions in coke are possible in cold-blast cupolas.

The flow rate of calcium carbide is important, and ¾ to 2 per cent of the metal charge is necessary. Compressed air can be used as the carrier. The calcium carbide used also can make a great difference. Various qualities have melting points which differ by as much as 400° F, for example.

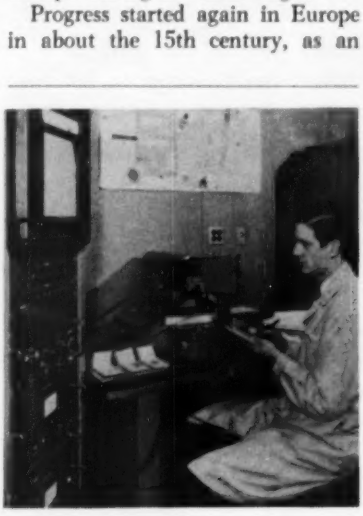
Tests by the author's company successfully reduced sulfur, but not economically enough. Problems include cost, nonavailability of low-melting-point calcium carbide, and difficulty with plugging of the injection lance at the tuyeres.

Heat Treatment of Aluminum Alloys, by Paul H. Hookings, Granby Consolidated Mining, Smelting, & Power Co. Solution heat treatment consists of raising the temperature of castings to near the melting point and holding that temperature to bring component elements into solution. Temperature then is reduced quickly by quenching, which increases the degree of supersaturation and prevents settling out of alloying elements. Slow cooling yields soft, ductile metal with low tensile strength. Quenching with aging lowers elongation, but increases tensile strength and hardness. Quenching without aging gives intermediate results.

Stress relieving consists in Canada of holding castings at 530° F for 10 hr to relieve internal stresses. Degrowthing is the same treatment and is required when castings will be used at higher than normal temperatures, at which growth might occur, with consequent loss of dimensional accuracy.

Five Thousand Years of Progress in Bronze Castings, by J. B. Hopkinson, North Shore Foundry Ltd. The first copper probably was found in native lump form and beaten into shape. Similarly, the first smelting of copper undoubtedly occurred accidentally in a campfire. Bronze probably was produced by chance when tin-bearing copper ore was melted. Progress in the casting of copper took place all over the world, partially by independent development and partially by the transfer of knowledge, but came pretty much to a halt in Europe during the Dark Ages.

Progress started again in Europe in about the 15th century, as an accompaniment of the Italian Renaissance. By the end of the 16th century, new alloys were being developed as well as new equipment and methods for molding, melting, and sand mixing.



CHEMICAL ANALYSIS: Technician runs chemical analysis on a General Electric x-ray spectrometer at Rosedale Foundry, Hicksville, N. Y. The unit enables workers to reduce a normal 8-hr time lapse for chemical analysis to only 15 or 20 minutes

Practical Application of Synthetic Resins for Foundry Use, by Walter E. Wenninga, Waldor Enterprises Ltd. First attempts to fabricate tools from plastic materials were made in the early thirties, but inadequate dimensional stability and low abrasion resistance of the early resins restricted their usefulness.

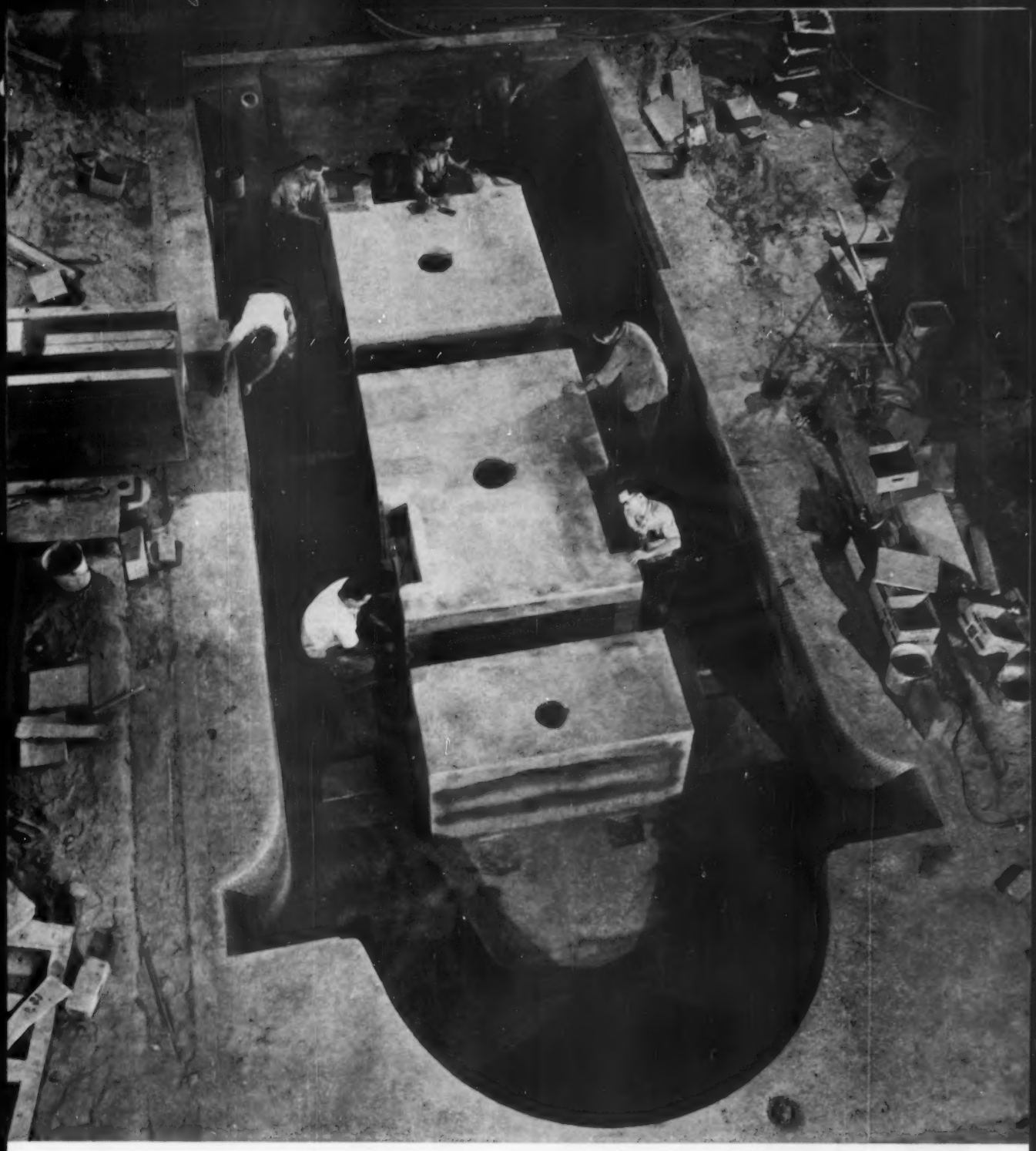
More recently, development of the epoxy resins has made possible the production of accurate tools in a fraction of the time otherwise required and with consequent economy. Epoxy resins cure or harden without the formation of by-products, permitting the production of bubble-free castings. Shrinkage during curing is so low that with proper control it is negligible.

These resins have high mechanical strength and good water and chemical resistance and are easy to use with normal shop equipment. Master wood patterns may be made with allowances for single shrinkage only. Other advantages of epoxy tools include wear resistance, ease of maintenance, good sand release, light weight, and long storage life.

Educating Our Future Foundry Personnel, by W. C. Catherall, Vancouver Technical School. A technical student should select the type of education best suited both for him and the industry in which he is to work. No industry is any better than the people in it.

The foundry industry has many problems and needs people trained properly to solve these problems. Students must be taught the sciences involved in the industry, the nature of foundry processes, and the economics of the business.

Vancouver Technical School has both foundry and patternmaking course facilities. Foundry courses are popular among students, and those who major in machine shop and automotive work take foundry in the 12th year. Last year, the students produced 8000 lb of gray iron castings, 1000 lb of aluminum castings, and 300 lb of copper-base castings, all as part of student projects.



The cores and this mold for a 426,000 lb steel casting were made by Mesta Machine Company with Venango sand — one of 35 grades of foundry sand available from Pennsylvania Glass Sand Corporation. Next time you need sand or silica flour for any casting requirement, contact PGS.

PENNSYLVANIA GLASS SAND CORPORATION

INDUSTRIAL SILICA DIVISION PIONEER SILICA PRODUCTS CO.

Sales offices in New York, Pittsburgh, St. Louis and Dallas · **Plants** in Newport, N. J. · Mapleton, Pa. · McVeytown, Pa. · Utica, Pa. · Berkeley Springs, W. Va. · Dundee, Ohio · Geauga Lake, Ohio · Phalanx, Ohio · Klondike, Mo. · Pacific, Mo. · Mill Creek, Okla. · Brady, Texas.

Circle 641 on Page 55

Laboratories Feature New Plant

Of Supplies Manufacturer

New plant contains 60,000 sq ft of space, including 12,000 sq ft of laboratory and office facilities. Not shown is a 40,000-sq-ft addition to the manufacturing area

● MORE THAN 150 products for foundries, steel mills, and other metalworking plants are manufactured in an impressive new plant in a western suburb of Cleveland. It's the home of Foundry Services Inc., which moved to Cleveland from Columbus, Ohio, only last year. The move was made primarily to take advantage of Cleveland's central location and its prominent position as a foundry and steelmaking center.

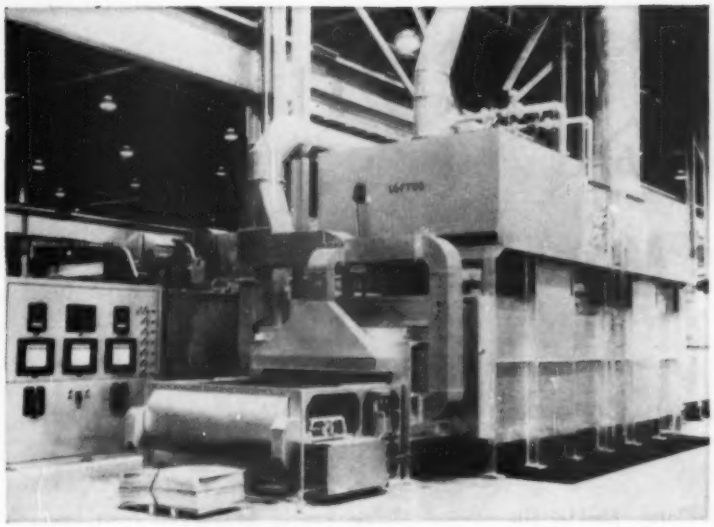
When Foseco moved into the new plant, it took possession of a building built expressly for its purposes, with 60,000 sq ft of space, including 12,000 sq ft of laboratory and office facilities. It was a far cry from the 3000 sq ft of manufacturing area in the Brooklyn, N. Y., structure where the company began production in this country less than ten years ago, before it moved to Columbus. Today, a 40,000-sq-ft addition which will double the production facilities is under construction.

The entire plant is modern and efficient, but the firm is particularly proud of its laboratory facilities. These include a chemical lab with ancillary room, a metallurgical lab and darkroom, a workshop, two production quality control laboratories, and a pilot foundry equipped to melt all metals except steel. The foundry is used for research and development work and for production quality control. Tests involving steel are made in nearby foundries. The laboratory staff currently totals 15 technical people, plus two secretaries.

Foseco products include exothermic materials; fluxes; degassers; grain refiners; mold, die, and chill coats; sodium silicate binder; core pastes; mold release agents; deoxidizers; refractory washes; desulfurizers; and many other supplies for the metalworking industries.

Laboratory facilities are extensive. The staff currently totals 15 technical people

Pilot foundry is used for research and development work and for production quality control



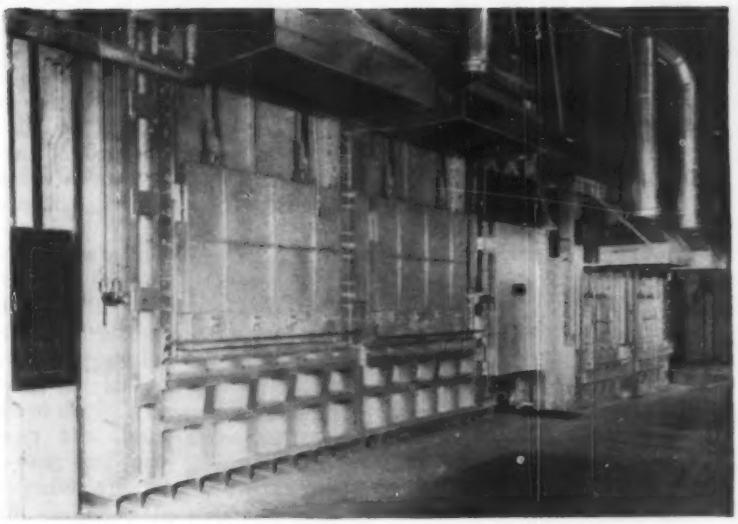
LOFTUS *Aluminum* FURNACES

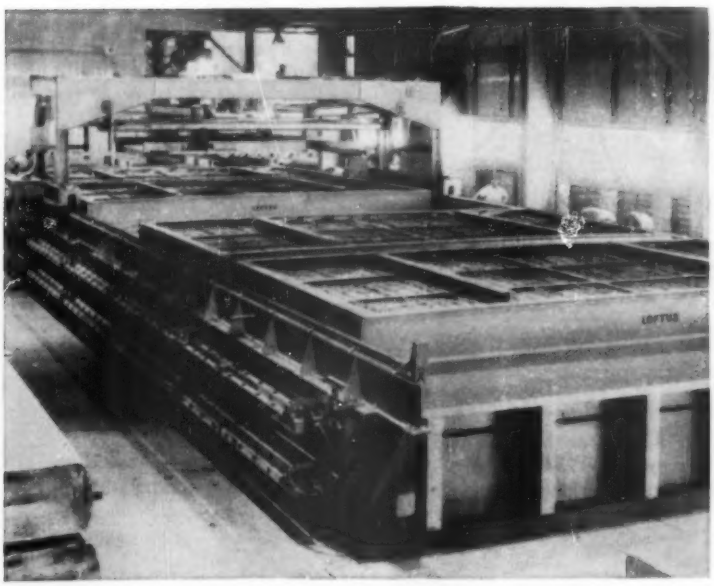
for
melting, holding,
reheating, annealing,
homogenizing

The many repeat orders for Loftus furnaces are the best evidence of customer satisfaction. Loftus furnaces offer:

- **High Production**
- **Economical Operation**
- **Low Maintenance**
- **Rugged Construction**

Whether building or expanding, you too can benefit from the wealth of experience available from Loftus.





Loftus custom-builds complete plants and specializes in furnaces of all types and sizes for both ferrous and non-ferrous metals. Whatever your requirements, it will pay you to call on the engineering and construction know-how developed by Loftus over more than two decades of service to American metal producers.

From first heat to heat treat, look to

LOFTUS

Engineering Corporation

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Circle 642 on Page 55

60.15.3

Fair Business Outlook Seen by

Foundry Equipment Manufacturers

By WILLIAM G. GUDE
Editor

● DESPITE the slower trend in foundry equipment sales in recent months, manufacturers are moderately optimistic about the 1961 outlook. This year's orders will fall somewhat below the 1959 total, as indicated in the accompanying chart, but most equipment firms expect 1961 business to equal or exceed that of last year.

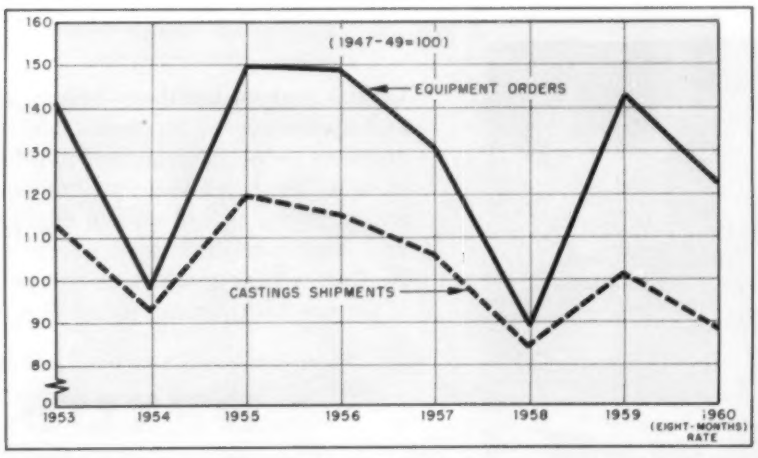
This is the picture indicated by members of the Foundry Equipment Manufacturers Association at their 42nd annual meeting held at the Greenbrier, White Sulphur Springs, W. Va., Oct. 20-22.

FEMA President Einar A. Borch, National Metal Abrasive Co., Cleveland, presided at the annual business meeting at which he and C. R. Heller, executive secretary-treasurer, reported on the past year's activities of the association.

Progress by the American Foundrymen's Society in its effort to make exhibits at the foundry shows more effective and economical was discussed by its president, Norman J. Dunbeck, Eastern Clay Products Dept., International Minerals & Chemical Corp., Skokie, Ill.

Foreign Trade—A panel discussion of foreign trade was presented by two speakers—Oscar R. Strackbein, chairman, Nationwide Committee on Import-Export Policy, and James T. O'Connell, undersecretary of Labor of the United States. Mr. Strackbein pointed out that even though we still are exporting more goods than we are importing, government subsidies account for about $5 billion or more of our exports.

The $30 billion worth of machinery which we have exported during the last 10 to 12 years has improved the productive efficiency of foreign manufacturers to the extent that they are able to undersell us in this country. Such items as automobiles, steel, and typewriters, which at one time we exported heavily, now are being received from foreign producers in sizable quantities.



Sales index of the Foundry Equipment Manufacturers Association has followed the trend of foundry operations in recent years. Except for 1954 and 1958, however, equipment sales have been well above the rate of castings shipments

Mr. Strackbein maintains that the U. S. State Department has undue influence in establishing tariffs which affect imports, and differences in production costs between the United States and foreign producers on many goods place this country in an untenable position.

Mr. O'Connell explained that foreign aid, expenditures by tourists, and foreign investments account for our deficiency in the trade balance. He sees no likelihood of a reduction in the first two items, and indicated that initiative on the part of both government and industry is necessary to close the gap. Mr. O'Connell said that differences in wage rates here and abroad should not be overstressed, because foreign producers have the disadvantages of high raw material costs, elevated interest rates, and relatively heavy costs of fringe benefits for labor.

The Undersecretary looks to activities of the international General Agreement on Tariff and Trade as holding considerable promise for improving exports of this country.

Highlights of activities of various other trade associations were reported by representatives of these groups. Organizations and their representatives included: American Foundrymen's Society, William W. Maloney; Foundry Educational Foundation, Frank G. Steinebach; Foundry Facings Manufacturers Association, Edward H. King; Gray Iron Founders' Society, Donald H. Workman; Malleable Founders' Society, Lowell D. Ryan; National Castings Council, A. M. Nutter; Non-Ferrous Founders' Society, Herbert F. Scobie; National Foundry Association, Charles T. Sheehan; Steel Founders' Society of America, F. Kermit Donaldson.

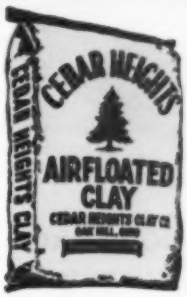
Little Competition — American manufacturers of foundry equip-

What does the average foundryman say when he rub-tests samples of

CEDAR HEIGHTS *air floated clay?*

He usually exclaims:

SOFT AS VELVET!
FINE AS FLOUR!
LIGHT AS AIR!

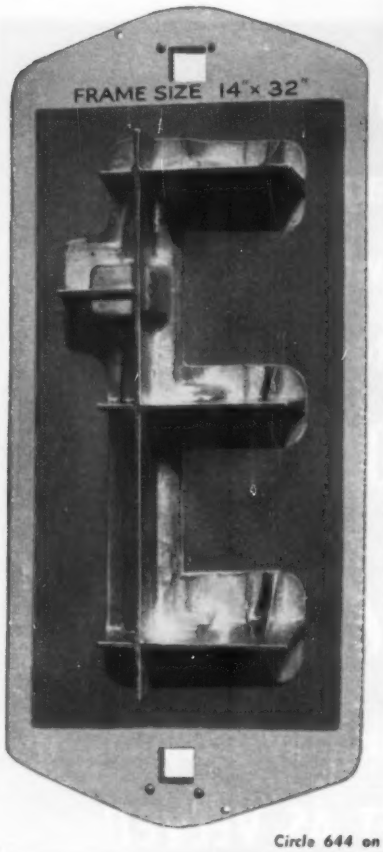


The high quality of CEDAR HEIGHTS processed clays is assured by close laboratory control. It's a matter of superior raw materials in the beginning, and careful attention through mining, screening, grinding and packaging afterward. Bonding clays and fire clays for all foundry needs can be delivered in a hurry at very attractive prices. Let us give you the name of your nearest dealer.

Ask your distributor or write to us direct for free samples of our products.

CEDAR HEIGHTS CLAY COMPANY

50 PORTSMOUTH ROAD
OAK HILL, OHIO



Let's talk profits!
Let's talk
increased production!
Let's talk about . . .

TAMASTONE

PATTERN COMPOUND

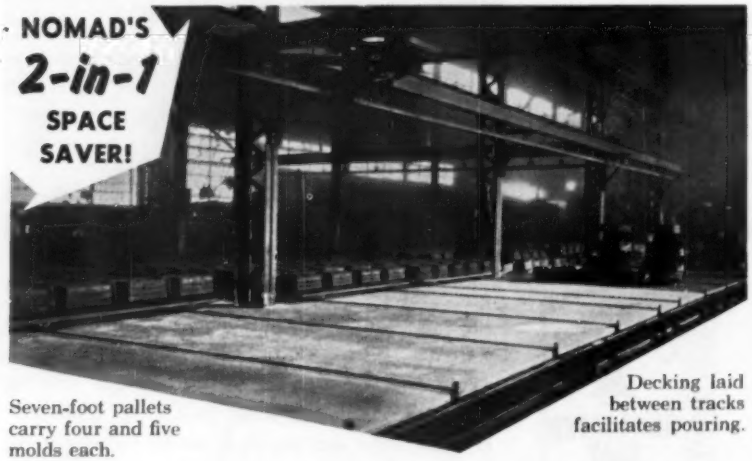
The Drier pattern at left is for air intake diesel manifold made from an original master pattern. *Only one skrinkage!* Material is aluminum. Pattern was used for 50 Driers. Only 3 hours labor and 35 pounds of TAMASTONE were required. Up to 1,000 castings have been made from a plate of this type!

No special skill needed to increase production 400% or more! . . . WRITE . . .

TAMMS INDUSTRIES CO.
228 N. LaSalle Street
Chicago 1, Illinois

Circle 644 on Page 55

NOMAD'S *2-in-1* SPACE SAVER!



Seven-foot pallets carry four and five molds each.

Decking laid between tracks facilitates pouring.

GET MORE USE FROM EXISTING FLOOR SPACE!

A Nomad 2-Level Track Conveyor gives you two conveyors in the space occupied by one. It allows the molder to stay at his work station as molds on wheeled pallets are conveyed away on the top track. The bottom track is used for returning bottom boards and pallets.

EVEN GREATER PRODUCTIVITY and efficiency comes from installing labor-saving Mold Dumps at shakeout and Pallet Raisers at the molding end.

If space is at a premium in your foundry, WRITE TODAY!

NOMAD EQUIPMENT

NOMAD EQUIPMENT CORPORATION
3110 W. FOND DU LAC AVE. • MILWAUKEE 10, WIS.
DESIGNERS and MANUFACTURERS of COMPLETE CONVEYOR SYSTEMS

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ment have experienced relatively little competition from foreign producers, it was indicated in a report by C. H. Barnett, Foundry Equipment Co., Cleveland, chairman of the FEMA Statistical Committee. A committee study showed that about half of the manufacturers experienced no competition, and others reported only relatively minor competition. Export business represents a rather small part of the sale of domestic manufacturers, 75 per cent of the companies stating that their export trade was less than 10 per cent of their total 1960 orders.

The committee's study also indicated that a reduction in labor cost is the primary consideration of foundries in the purchase of new equipment. This factor is followed in importance by the desire to improve product quality and production.

Capital Spending—A small decrease in capital expenditures can be expected next year, it was forecast by Dexter M. Keezer, vice president, McGraw-Hill Publishing Co., New York. Although the foundry industry has much obsolete equipment, a decline of 10 to 15 per cent in equipment purchases is indicated for 1961.

Looking to the next decade, he predicted a gross national product for 1970 of $750 billion, with an increase of 60 per cent in capital expenditures compared with 1960. The factors promoting increased capital expenditures ten years' hence will include high labor costs, the presence of considerable obsolete equipment, and a relatively small supply of labor.

Officers Re-elected—Current officers of FEMA were re-elected. They include: President, Einar A. Borch, executive vice president, National Metal Abrasive Co., Cleveland; first vice president, Richard A. Brackett, executive vice president, Spencer Turbine Co., Hartford, Conn.; second vice president, Chester G. Hawley, general sales manager, Industrial Div., Jeffrey Mfg. Co., Columbus, Ohio; executive secretary - treasurer, C. R. Heller, Washington.

New directors are Mr. Borch. John M. Kane, American Air Filter Co., Louisville, Ky., and George A. Saar, Allis-Chalmers Mfg. Co., Milwaukee.

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SOME FOUNDRY PROBLEMS

ARE **TOUGHER** THAN OTHERS!

And nobody has all the answers! Nevertheless, the men who staff our foundry service department have been able to solve many ferrous casting problems . . . are well-qualified by experience and training to help you.

Ohio Ferro-Alloys foundry service men are ready, willing and able to discuss your casting problem, even if it does not relate to alloying. They talk your language, they know the foundry business and they have the kind of attitude that says: "Our job isn't finished until yours is."

QUALITY SERVICE DEPENDABILITY

Ohio Ferro-Alloys Corporation
Canton, Ohio

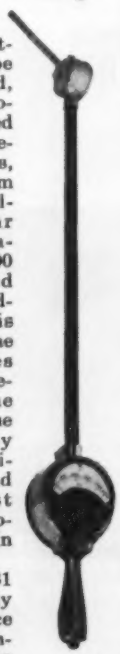
Good Castings require accurate pouring temperatures

Alnor

PYRO LANCE gives instant readings

The self-contained, portable, Pyro Lance Type 2981 with the enclosed, protected type thermocouple is especially suited to temperature measurements of molten brass, bronze, copper, aluminum bronze, magnesium alloys, and any similar metals where temperatures are not over 2300 deg. F. The protected thermocouple, with adjustable angle head, is mounted in the tip of the lance and thus takes temperature readings below the surface of the molten metal, with a true reading unaffected by dross or surface conditions. The enclosed head is protected against flame, fumes, and corrosion, assuring long life in severe service.

Pyro Lance Type 2981 has reading dial in sturdy aluminum handle. Price $97.00. For complete information on various models and prices write for Bulletin 1724.



Type 2981

ALNOR INSTRUMENT CO.
Division of
Illinois Testing Laboratories, Inc.
Alnor INSTRUMENTS
Room 511
420 N. LaSalle Street
Chicago 10, Illinois

Circle 647 on Page 55

MAGNESIUM ASSOCIATION CONVENTION

Includes Discussion of Casting Topics

● SIXTEENTH annual convention of the Magnesium Association attracted an attendance of approximately 400 persons to Cleveland on Oct. 17-19.

A comprehensive program of technical papers was presented during the three days, with topics covering properties and applications of various forms of magnesium.

Cast magnesium was treated in two papers, one on permanent mold castings and the other on diecastings, plus a panel discussion of magnesium precision castings.

Centrifuge Method—Use of the centrifuge methods in producing permanent mold castings was described by Warren C. Smith, president, H & S Metal Products Co., Los Angeles. It is particularly adapted to castings involving large thin webs and castings having highly stressed areas where a minimum amount of microporosity is requisite to satisfactory performance and reliability. The 25-hp centrifugal machine is electronically controlled.

Diecasting — Development of magnesium alloy diecasting at the AC Spark Plug Div., General Motors Corp., Flint, Mich., was discussed by Steven L. Strong of that company. Tooling and processes used from the trial periods of test castings during the early 1950s until operation of the present installation were described. Features include the recent development of vacuum feeding of metal in conjunction with an automatic casting machine. Successful results in production of a number of castings has prompted the expansion of the plant's facilities.

Precision Castings—This was a discussion session under the chairmanship of E. V. Blackmun, Aluminum Co. of America, Cleveland. Mr. Blackmun, chairman of the technical committee, Die Casting Research Foundation, spoke briefly on technical achievements in the diecasting industry. He also discussed current work of the technical committee.

Production of complicated, precision magnesium castings in dry sand molds was discussed by Richard Hanson, Wellman Bronze & Aluminum Co., Cleveland. He emphasized the importance of using well constructed, machined patterns, coreboxes, jigs, and fixtures. He suggested that coreboxes be machined in the direction of the draw to facilitate core removal.

Dimensional tolerances on castings produced by any process utilizing patterns can be no better than the accuracy of the patterns. Special attention should be given to shrinkage allowances because they differ for various molding methods and for casting design. He stated also that better casting accuracy is obtainable when a part is designed properly for the casting process.

During the discussion period it was pointed out that foundrymen need to know and understand the load factors to which a cast part will be subjected so that they may select the correct metal for the part.

New Officers are Chosen by Chicago Gray Iron Group

Charles A. Daugherty, vice president, T. L. Arzt Foundry Co., is the new chairman of the Chicago Area Management Executives Group of the Gray Iron Founders' Society. He succeeds Robert H. Lehmpuhl, president, Sheffield Foundry Co.

New vice chairman is Chester R. Lindgren, president, Lindgren Foundry Co., Batavia, Ill. Re-elected secretary is C. V. Adams, secretary, Vulcan Iron Works Inc.

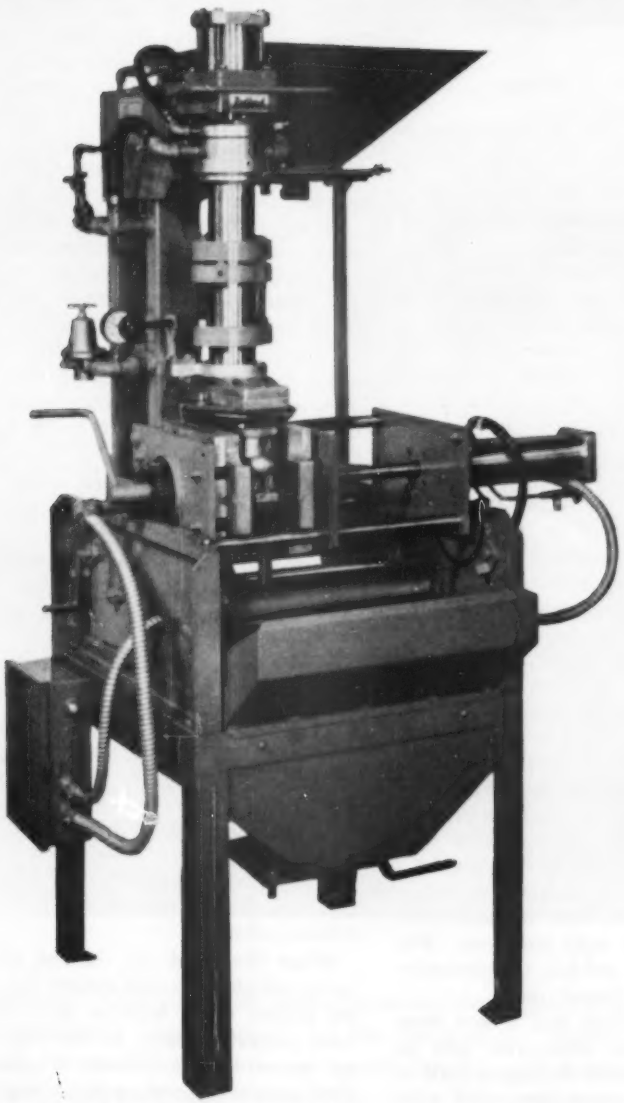
These officers for the coming year were named at the group's quarterly meeting at the Chicago Athletic Association, Sept. 27.

Guest speaker was I. G. Robinson, manager of industrial engineering, Lester B. Knight & Associates Inc., and his subject "The Use of Management Consultants for Small and Middle Size Business."

The speaker asserted that the smaller the foundry, the less likely it is to have staff members who can solve management problems. Outside consultants can supply advice without interruptions of operations, and such advice carries no bias. He emphasized that size of a foundry is not the criterion as to the need for a consultant.

Redford

MODEL HP-4
SHELL CORE BLOWER



A very fast low cost machine that is setting new standards in the production of small shell cores. The quality of intricate shell cores is improved because sand is blown into core box cavities through unrestricted blow holes. A novel cradle-type core box clamp is used to invert the core box and at the same time bring the core box within easy reach of the operator for core removal. There is no out of balance weight to struggle with. The machine can handle core boxes up to 10" x 10" in size. Shell cores may weigh up to 4 lbs., before draining.

The HP-4 Redford has ample blow capacity and can also be used to blow Furfural resin sand mixes into heated core boxes.

Price F.O.B. Detroit—$1,200.00
For complete information write for Bulletin HP-4

. . Above cores illustrate the variety of work that can be done with the Redford HP-4 Core Blower.

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20733 Glendale - Detroit 23, Mich.
Phone: KEnwood 1-8611

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The Sandman Says

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"Belling the Cat"

● CORRECT ME if I'm wrong, but I believe it was old Aesop who told of the mice and their growing fear of the family cat. In conference, they decided that their safety would be assured if the cat wore a bell, and they agreed by unanimous vote that the cat *must* be belled! Then the inevitable question arose: "Who will bell the cat?"

I believe there is an analogy between this fable and some of the situations we face daily in the foundry, for we too lack the courage to remove some of the evils that beset us. Among these is the seemingly inexcusable repetition of a preventable casting defect.

A defective casting becomes a liability for various reasons: 1. It usually represents a definite financial loss to the company, as well as an ominous reflection on performance and reputation. 2. It delays casting delivery, and tends to promote customer dissatisfaction. 3. It retards—and in some instances disrupts—a production schedule. 4. It frequently reflects the failure of a mechanic, causing loss of face and a lowering of morale as well as strained relations between worker and foreman.

Of course, other undesirable effects also may be attributed to the defective casting, but the foregoing are enough to warrant a concentrated study of defect prevention.

Defining Defective—In my vocabulary, a defective casting is one the customer pronounces incapable of fulfilling its intended purpose. As the buyer, he knows what he wants and what he is prepared to pay for it. He alone should decide whether a casting is to be accepted or rejected. He may delegate this authority to another, but authority should not be assumed arbitrarily by anyone less capable or responsible, except when a defect is so glaring as to make rejection mandatory.

Quality Is Goal—Any foundryman with an ounce of pride in his profession strives to produce the highest quality castings economically possible. Aside from customer satisfaction and the expansion of his market, there is the matter of personal pride of performance.

I have yet to meet the foundryman who wanted to make bad castings or even would excuse recognizably poor workmanship. There are some who have become apathetic as to product quality, perhaps as a result of inferior equipment or materials; inadequate supervision, usually dictated by a low budget; or customers who were indiscriminate or excessively price conscious. But surely these are not representative of American foundrymen.

Many molders, and I have been one of them, have quit jobs in foundries, despite the urgent need of a paycheck, rather than work with deplorable equipment and materials, knowing that their efforts could only produce revolting results. No paycheck can compensate a good mechanic for the waste of his talents.

Most in the Middle—It has been observed—perhaps facetiously—that society is like a glass of beer: Froth at the top, dregs at the bottom, and some mighty good material between. Of course, this comparison in no way applies to the society of foundrymen, but we certainly do have different levels of operation in our industry.

The top stratum, with considerable capital, has the benefit of scientific methods and controls which practically assure high quality of product, a minimum of loss, and an amazing degree of efficiency.

The lowest level, often referred to as the one or two-man shop, depends mainly on the artistry of the molder, and this asset often is taxed beyond human limits.

Between these extremes, and well in the majority, are the plants which employ from 10 to 100 workers, keep up with progress in the field, enjoy the benefits of mechanized equipment insofar as their means and circumstances will permit, and strive to produce a product that will do credit to the industry and bring profit to themselves. It is in this category that I am interested—an interest that has become intensified over the last 50 years.

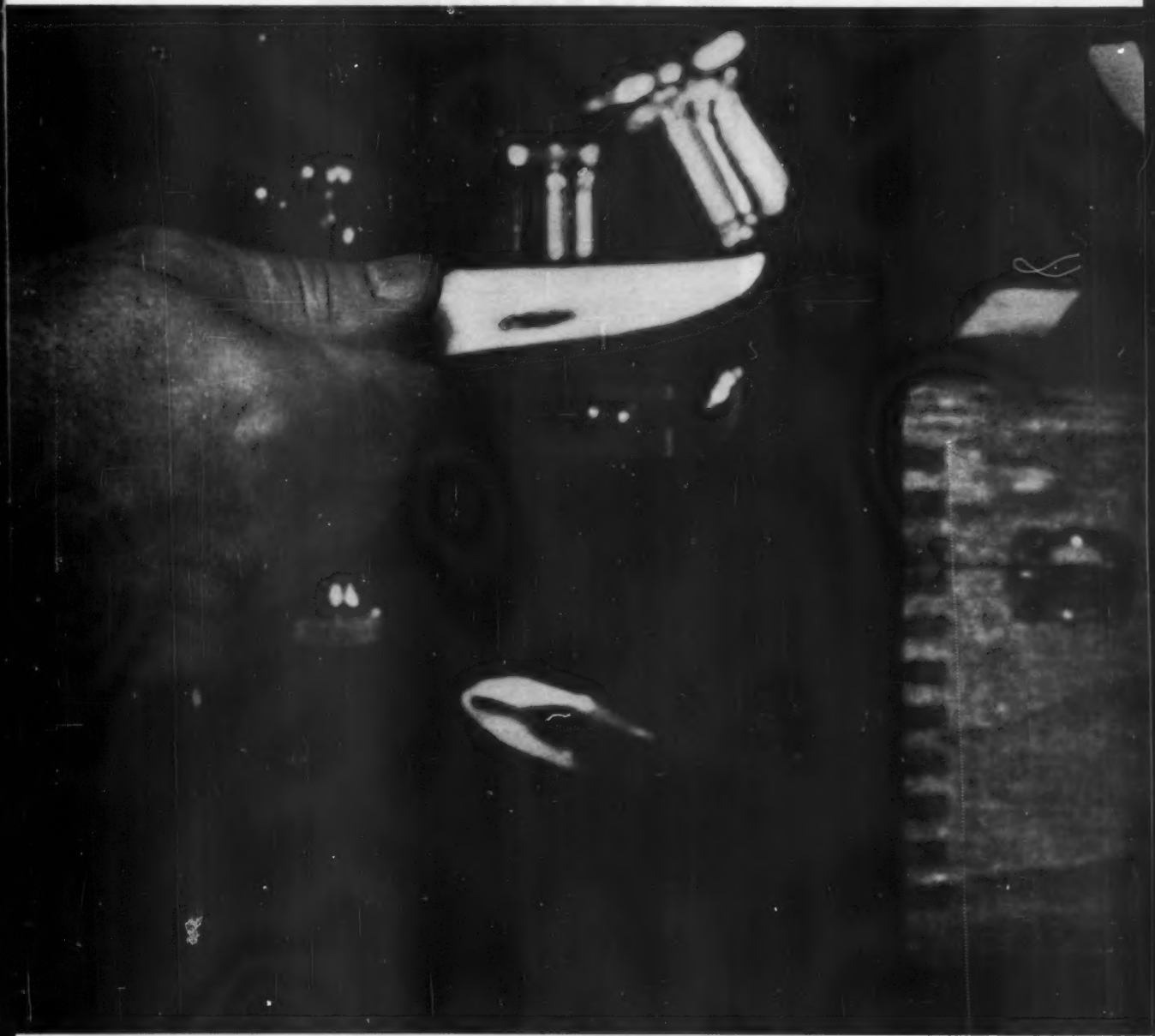
Despite all our experience, study, and sleepless nights, we still produce some castings that seem an affront to our intelligence. We add insult to injury by permitting continual repetition of our mistakes to a point where we apathetically accept the situation as an inevitable condition, beyond remedy.

Such an attitude is ridiculous, yet many of us face it every day. Foundry consultants who are employed to remedy a practice that has gone sour must weep in despair while trying to untangle a condition that seems hopeless. The fact that they usually succeed is a high tribute indeed.

What We Need—At the risk of being ridiculed, I would suggest that we subject every foundry worker, from general manager to the newest apprentice, to courses in applied psychology and, going a step further, in understanding basic English communication.

We require more light and less heat in our postmortem discussions, more logic and less passion if we are to find sensible solutions to our casting problems. We also must learn to communicate understandably, to know precisely what we

coke...tested and retested...
to give you better melting in your cupola



Coke that gives optimum performance in the cupola doesn't "just happen." It's the result of quality control from mine to cupola—and this includes testing every step of the way.

Every day in every Semet-Solvay coke plant, continuous tests are conducted to determine and control product quality and uniformity: Chemical tests, pyrometric tests, physical tests. Shatter tests, specific gravity tests, porosity tests.

Result: Coke that is low in ash and sulphur, high in carbon, strong and uniform . . . to super-heat and melt your metals in the hottest, fastest, most efficient cupola operation you can possibly have.

Get the whole story by writing today for our just-off-the-press brochure, "The Advantages of Using Semet-Solvay Foundry Coke."

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SEMET-SOLVAY DIVISION
Dept. 575-BH, 40 Rector Street,
New York 6, N. Y.

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want to say in the fewest and simplest words.

A bad casting is not so much a failure of materials or equipment as it is of method or, more precisely, of human behavior.

Man is a stubborn animal. He seemingly would prefer to be wrong than to admit the possibility of an error which might reflect on him or his department. Although it is not always easy to determine the actual cause of a defect—for in many instances the experts refer to both a major and a minor cause—most of our casting failures clearly indicate the sources of the trouble.

The Postmortem — Among the more obvious casting defects, we might list scab, blow, buckle, sandwash, slag, core break, drop, crush, and others which are self-evident and undebatable. But when we attempt to find who and what was responsible, there we separate, each in hostile mood, to his own bailiwick.

For instance—and this is not unusual—a casting is scrapped because of a blow hole. It is agreed generally that core gas under pressure has been forced into the upper reaches of the mold cavity, seeking a new vent and thus preventing the metal from uniting at this point of gas pressure. Or, if explosive force has been exerted, porosity, pinholes, or gas pockets may occur throughout the casting.

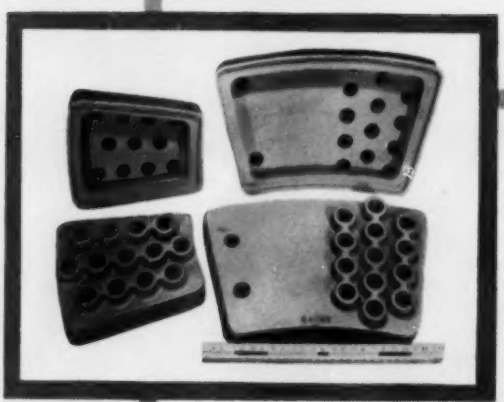
Everyone agrees that gas is the cause of the trouble and that the core in question was vented insufficiently or had in some way absorbed moisture or otherwise was overlooked with volatile material. Of course, a good core will blow if all vents are stopped off—and this has happened.

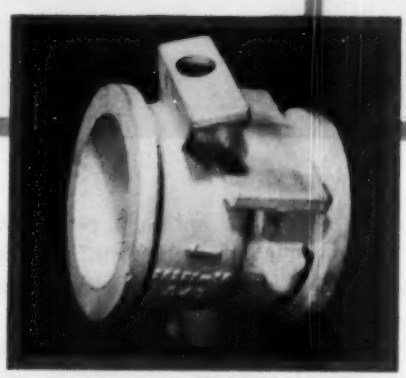
But in this instance everyone agrees that core gas is the villain—everyone, that is, except the coremaker. He is likely to insist that the trouble was due solely to dull iron. He reasons that if the metal had been hotter, the excess gas would have been driven off more rapidly, resulting in a sound casting. In other words, hotter metal would serve to complete the baking or drying, reducing core gas pressure below that of the molten metal.

Why do we emphasize *hot* rather than *fluid* metal? Temperature alone is a poor criterion, as any

QUALITY CASTINGS *are our business*

We don't make castings—but our customers do. And, these customers—leaders in the foundry industry—have learned to rely on Whitehead for their alloying needs. In all of the castings illustrated, the alloys needed to impart their special properties were all available from Whitehead.





*Producers' names available on request

NICKEL	IRON FOUNDRY INOCULANTS	COLUMBIUM TANTALUM	DUCTILE IRON ADDITIVES
TITANIUM	SILICON	BORON	SILICO MANGANESE

malleable foundryman can testify. Iron that is hot enough to expel all gas from a jacket core is likely to destroy chaplets, distort the core, or magnify the cleaning job.

Prognosis is one thing, diagnosis is another, and many of us seem weak on both counts. If satisfactory remedies are to be achieved, and casting losses reduced to an acceptable minimum, we must discard palliatives and get to the source of our trouble with an effective answer.

Regardless of whose toes are stepped on, we must find someone with the courage, intelligence, and intestinal fortitude necessary to "bell this cat."

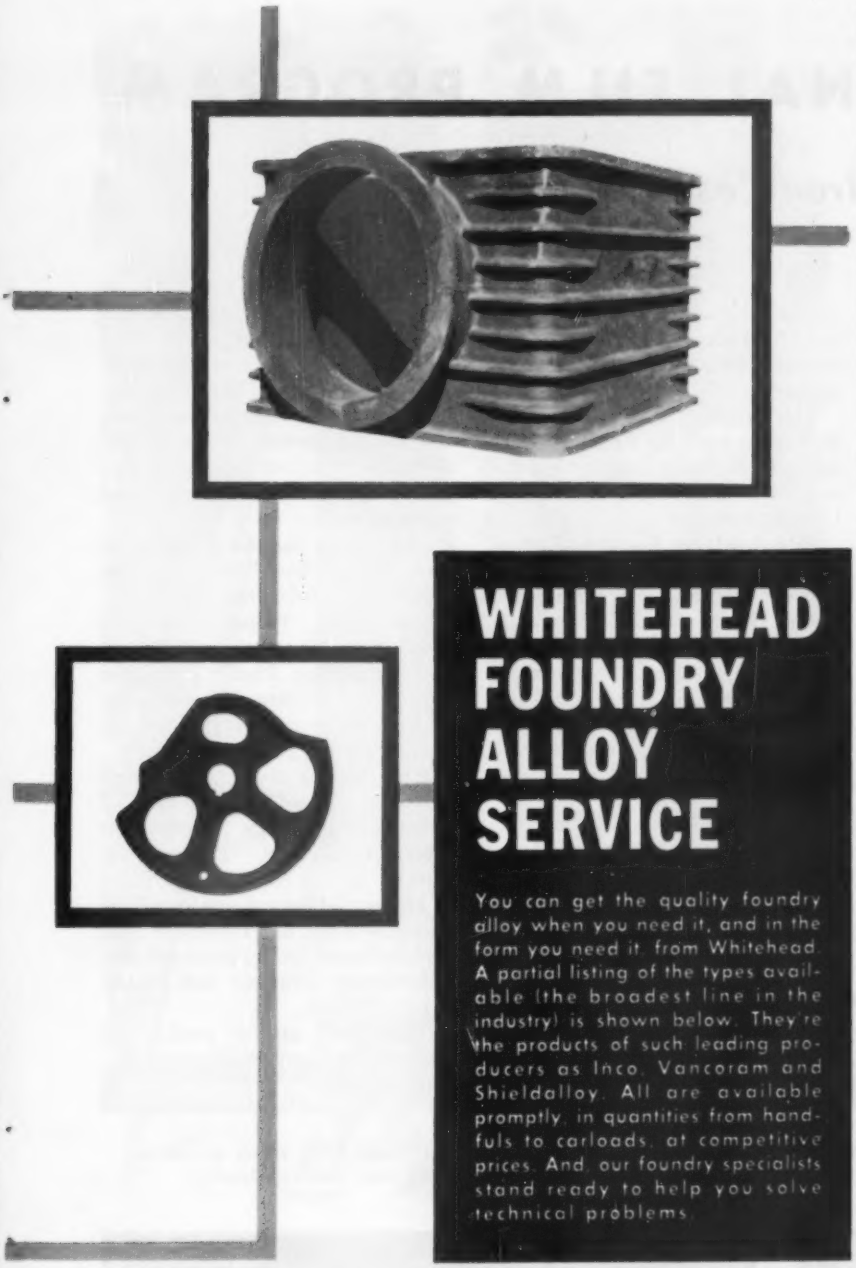
Book Review

1959 Compilation of ASTM Standards on Copper and Copper Alloys, hard cover, 720 pages, 6 x 9 in., published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price $7.50.

Compilation contains 137 standards of which 17 are new, revised, or have changed status since the previous edition in 1957. In addition to standards for cast and wrought copper and copper alloys, the book contains some information on nonferrous materials for electrical conductors and certain selected specifications on nonferrous metals and alloys for primary forms of copper, zinc, lead, and nickel used in copper-alloy products.

Standards include methods of test, definitions, specifications, classifications, and recommended practices.

"Top grade core sand. They get it from spinach"



WHITEHEAD FOUNDRY ALLOY SERVICE

You can get the quality foundry alloy when you need it, and in the form you need it, from Whitehead. A partial listing of the types available (the broadest line in the industry) is shown below. They're the products of such leading producers as Inco, Vancoram and Shieldalloy. All are available promptly, in quantities from handfuls to carloads, at competitive prices. And our foundry specialists stand ready to help you solve technical problems.

Write for your copy of Whitehead's Foundry Alloy Catalog.

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COLUMBIUM	CHROMIUM	MANGANESE	BINARY ALLOYS

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EDUCATIONAL FILM PROGRAM

To Promote Gray Iron Castings

● A NEW educational film program designed to promote use of gray iron castings has been launched by the Gray Iron Founders' Society.

Sales tools for the program eventually will include three separate color movies and six sound filmstrips. A 30-minute movie and three 18-minute filmstrips have been completed and the others are in production.

The entire series will be of assistance and interest to design and process engineers, castings buyers, machine shop superintendents, and value analysts. Copies of the films are being made available to gray iron foundries for individual presentation before their customers and prospects.

This program was made possible by a grant from the American Coke & Coal Chemicals Institute and the merchant coke producers of the United States.

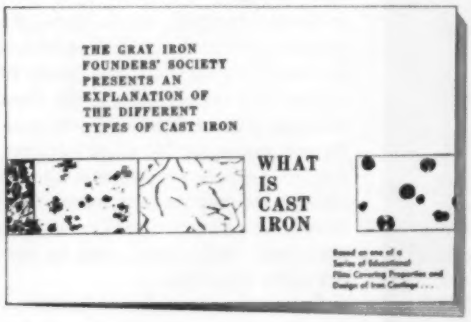
Rice Bowls to Rockets—Starting off the series is a color film, "Rice Bowls to Rockets," which traces the history of gray cast iron from early uses in ancient China down to modern applications. Narrated by Truman Bradley, it explains how cast iron has developed into a whole family of materials with varying characteristics and properties. "Rice Bowls and Rockets" is of general interest, offering both education and entertainment, whereas the subsequent filmstrips and movies get into the more technical aspects of gray iron properties, casting design, and machining.

The three completed filmstrips have these titles: "What Is Cast Iron?" (an explanation of the different types); "Properties of Gray Iron" and "Properties of Ductile and High-Alloy Iron." The latter two include an extension of the discussion of properties provided by heat treatment.

Filmstrips in production include "Casting Design and Analysis," "Cost-Saving Design Tricks with Gray Iron," and "Patterns for Profit."

The two additional movies will be "Straight Line to Production" (an explanation of casting processes) and "Machining, Grinding and Finishing."

The films are a product of Academy-McLarty Productions Inc., Buffalo.



A booklet accompanying each filmstrip is distributed after showing of the film to provide resume of main points

Tensile tester is used in one of many scenes showing properties of gray iron

Opening scene, which is being filmed here, shows an ancient Chinese family eating from their cast iron rice bowls

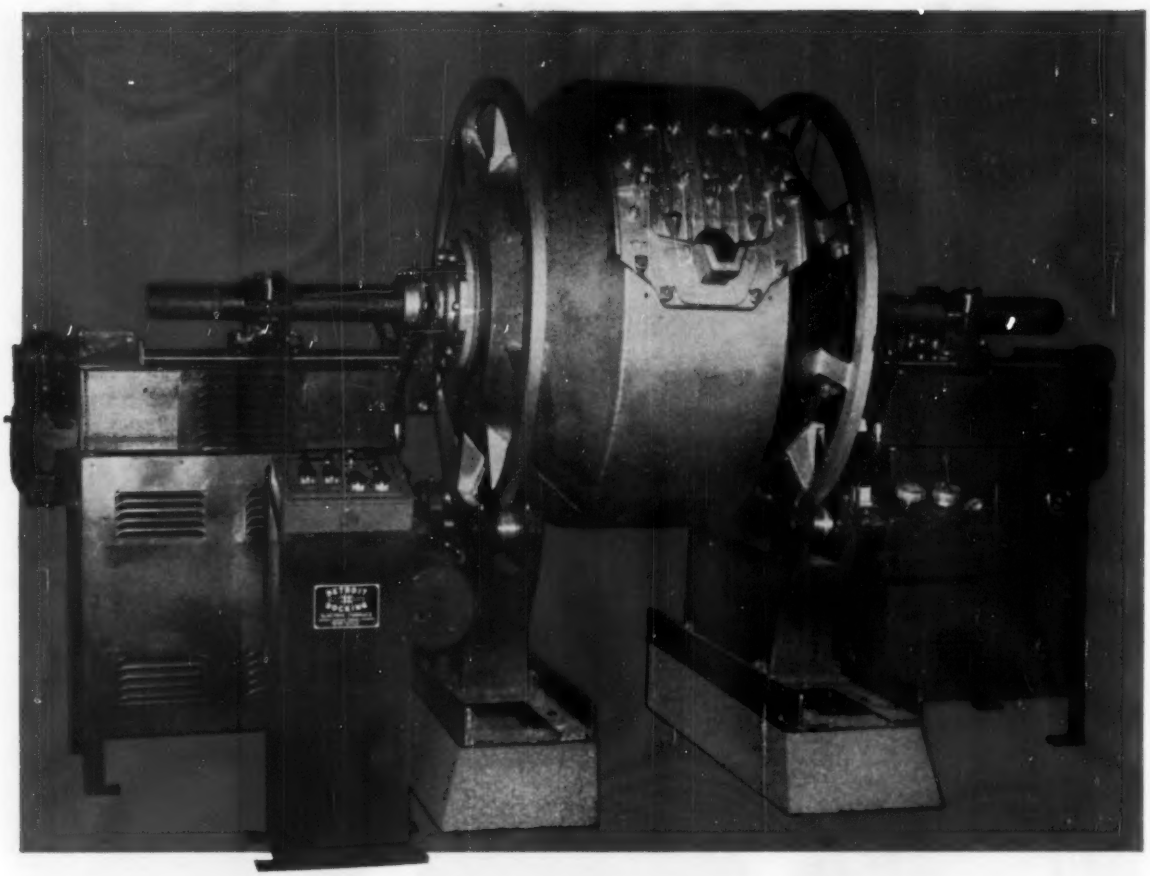
don't "sell out" your salesmen by half-selling this $6½ billion market

Missiles, earth movers, appliances, electronics, submarines, autos, airplanes... the foundry market participates in all growth industries... ranks fifth among all manufacturing. An important market... it takes concentration to sell it. Your salesmen know this. They don't waste time and money with half-hearted selling efforts. But what about your advertising? Are you relying on do-all, cover-all, horizontal publications to deliver your sales messages? Only FOUNDRY can give you enough penetration, enough readership, to do an adequate job. It reaches over 80,000 buying influences in the foundries accounting for 98% of industry's melting capacity. Ask your FOUNDRY representative for our Marketing Guide to the Metal Casting Market, or write for a copy today.

FOUNDRY a Penton publication

BPA ABP

The Business Magazine of the Metal Casting Market
Penton Building, Cleveland 13, Ohio



Get Greater Melting Efficiency With Detroit ROCKING Electric Furnaces

SIMPLE ARC CONTROL SYSTEM AND MOTORIZED ELECTRODES ASSURE MAXIMUM HEAT UTILIZATION, AUTOMATIC ELECTRODE POSITIONING

The new "P" Series Detroit Rocking Electric Furnaces feature a simplified arc control system combined with motor-driven, pedestal-mounted electrodes.

The indirect arc is automatically controlled by a magnetic amplifier which adjusts motor speed in direct proportion to arc unbalance. This instantaneous action provides maximum heat per power input. There are no moving parts, relays or contactors to break or wear out.

Standard graphite electrodes are independently mounted on pedestals and motor driven. A ½ h.p. D.C. motor drives the automatic control. Direct-connected ½ h.p. A.C. motors on each electrode permit manual push-button control at greater speeds than possible by hand. This speeds electrode positioning for charging and shell change.

For full details on the new "P" Series indirect arc Detroit Furnaces, write for Bulletin 5610.

Ratings for furnaces with pedestal-mounted electrodes, motor controlled

Furnace Type	KW Rating	Nominal Cold Charge	Minimum Molten Metal
LFCP	125	350	500
LFNP	150	500	750
LFYP	175	700	1250
AAP	250	1500	3000
AAP	400	1500	3000
CMP	400	4000	8000
CMP	600	4000	8000

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Detroit Electric Furnace Division, Kuhlman Electric Company • Bay City, Michigan

Foreign Representatives: in BRAZIL—Equipamentos Industrias, "Eisa" Ltd., Sao Paulo: CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 38, N. Y.; MEXICO: Cia Proveedora de Industrias, S.A. Apartado Postal No. 2783, Mexico 7, D.F., Mexico.

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F. W. E. SPIES
President, International Committee of Foundry Technical Associations

International Reports on Foundry Practice

Additional reports on technical papers presented at the recent International Foundry Congress in Zurich, Switzerland, are presented here. Discussion of a number of gray iron topics was published in the November issue

By M. M. HALLETT
Managing Director
Chamberlin & Hill Ltd., Walsall, England
European Editor, Foundry

● HYDROGEN in cast steel was the subject of a paper by P. Bastien (France—written in French). After reviewing the solubility of hydrogen at various temperatures, the author described a method of gas analysis by vacuum extraction at 1112° F and separating the hydrogen by diffusion through palladium.

In considering sources of hydrogen, a statistical study on acid open-hearth melts revealed the great importance of atmospheric moisture. Hydrogen was considered undesirable because it leads to the formation of blow holes and of flakes or other internal cracks and to embrittlement of ferritic steels.

Good steelmaking practice—including attention to dryness of refractories and of the charge—combined with an adequate boil will reduce hydrogen. To attain really low values, however, these practices should be supplemented by purging with a neutral gas such as argon or preferably by casting in vacuo. Steel as cast shows exceptionally good properties, the process being specially useful for 13 per cent chrome steel.

Gases in Ferroalloys, by B. Marincek (Switzerland—) and R. Limpach (Luxemburg—written in German). The hydrogen, oxygen, and nitrogen contents of 38 ferroalloys were studied in a vacuum extraction apparatus. The equipment was able to record the rate of gas evolution and thus to distinguish between gases firmly combined and those held more lightly. Analysis was performed at three temperatures, usually 2190, 2730, and 3630° F. The gas content recorded varied very widely over the alloys studied.

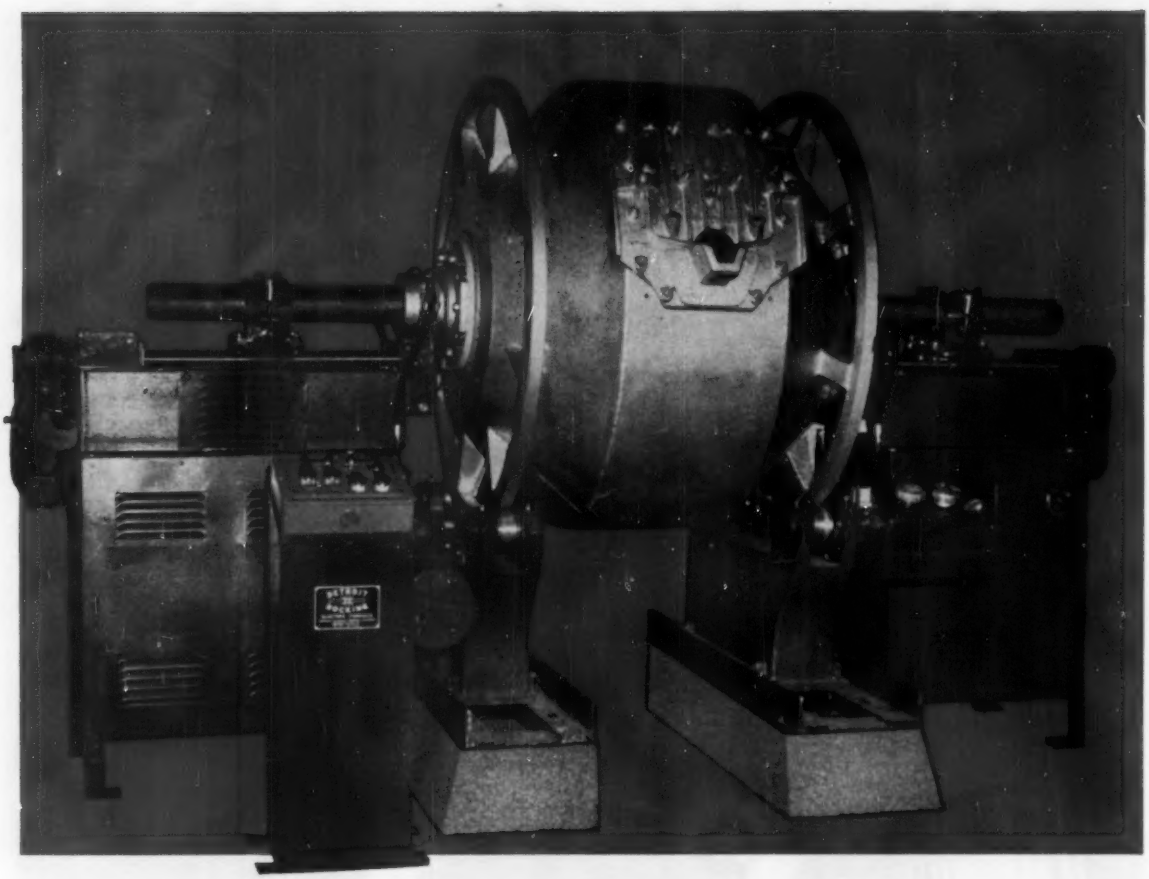
In ferrosilicons there was tendency for alloys with 75 per cent silicon to show maximum gas contents and in many alloys there was a clear connection between gas content and grain size, the finer the grain size the lower being the gas content. There was also a tendency for gas content, particularly oxygen, to rise with increasing period of storage. Some implications of these findings were discussed briefly.

Mold Washes—Considerable information on mold paints and washes for use in the steel foundry was given by J. M. Middleton and P. G. McIlroy (Great Britain—written in English) of the British Steel Castings Research Association. The first portion of the paper discussed the fundamental properties needed in a mold wash. The rate of settling of a suspension depends on the refractory grain size and density but is controlled in practice by the amount of the suspending agent, often a swelling bentonite. Sodium alginate was found to be another promising agent and was much less liable than bentonite to develop cracks on drying.

The thickness of the paint film depends on its consistency when applied and its specific gravity, there being a critical specific gravity at which the consistency increases rapidly with further additions so that the wash no longer penetrates the sand grains but builds up a thick film. Cracking on drying of bentonite zircon washes depends mainly on the clay zircon ratio, but in addition hard ramming of the sand mold and spraying of the face to increase dry strength locally will also reduce cracking of the wash. Friability of the paint film is controlled by the type of binder, e.g. dextrin, linseed oil or sulphite lye, and the consequent temperature at which it starts to decompose in relation to the temperature used to dry the mold.

The second part of the paper described tests in which coated cores were placed in hot furnaces or held just above molten steel or dipped into the steel. In general, these showed that if the coating did not crack on drying, further cracking at high temperatures was determined by the cracking tendency of the underlying sands. The good performance of sodium alginate washes was confirmed.

In a final series of tests various coated cores were incorporated in



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Furnace Type	KW Rating	Nominal Cold Charge	Minimum Molten Metal
LFCP	125	350	500
LFNP	150	500	750
LFYP	175	700	1250
AAP	250	1500	3000
AAP	400	1500	3000
CMP	400	4000	8000
CMP	600	4000	8000

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Circle 651 on Page 55

F. W. E. SPIES
President, International Committee of Foundry Technical Associations

International Reports on Foundry Practice

Additional reports on technical papers presented at the recent International Foundry Congress in Zurich, Switzerland, are presented here. Discussion of a number of gray iron topics was published in the November issue

By M. M. HALLETT
Managing Director
Chamberlin & Hill Ltd., Walsall, England
European Editor, Foundry

● HYDROGEN in cast steel was the subject of a paper by P. Bastien (France—written in French). After reviewing the solubility of hydrogen at various temperatures, the author described a method of gas analysis by vacuum extraction at 1112° F and separating the hydrogen by diffusion through palladium.

In considering sources of hydrogen, a statistical study on acid open-hearth melts revealed the great importance of atmospheric moisture. Hydrogen was considered undesirable because it leads to the formation of blow holes and of flakes or other internal cracks and to embrittlement of ferritic steels.

Good steelmaking practice—including attention to dryness of refractories and of the charge—combined with an adequate boil will reduce hydrogen. To attain really low values, however, these practices should be supplemented by purging with a neutral gas such as argon or preferably by casting in vacuo. Steel as cast shows exceptionally good properties, the process being specially useful for 13 per cent chrome steel.

Gases in Ferroalloys, by B. Marincek (Switzerland—) and R. Limpach (Luxemburg—written in German). The hydrogen, oxygen, and nitrogen contents of 38 ferroalloys were studied in a vacuum extraction apparatus. The equipment was able to record the rate of gas evolution and thus to distinguish between gases firmly combined and those held more lightly. Analysis was performed at three temperatures, usually 2190, 2730, and 3630° F. The gas content recorded varied very widely over the alloys studied.

In ferrosilicons there was tendency for alloys with 75 per cent silicon to show maximum gas contents and in many alloys there was a clear connection between gas content and grain size, the finer the grain size the lower being the gas content. There was also a tendency for gas content, particularly oxygen, to rise with increasing period of storage. Some implications of these findings were discussed briefly.

Mold Washes—Considerable information on mold paints and washes for use in the steel foundry was given by J. M. Middleton and P. G. McIlroy (Great Britain—written in English) of the British Steel Castings Research Association. The first portion of the paper discussed the fundamental properties needed in a mold wash. The rate of settling of a suspension depends on the refractory grain size and density but is controlled in practice by the amount of the suspending agent, often a swelling bentonite. Sodium alginate was found to be another promising agent and was much less liable than bentonite to develop cracks on drying.

The thickness of the paint film depends on its consistency when applied and its specific gravity, there being a critical specific gravity at which the consistency increases rapidly with further additions so that the wash no longer penetrates the sand grains but builds up a thick film. Cracking on drying of bentonite zircon washes depends mainly on the clay zircon ratio, but in addition hard ramming of the sand mold and spraying of the face to increase dry strength locally will also reduce cracking of the wash. Friability of the paint film is controlled by the type of binder, e.g. dextrin, linseed oil or sulphite lye, and the consequent temperature at which it starts to decompose in relation to the temperature used to dry the mold.

The second part of the paper described tests in which coated cores were placed in hot furnaces or held just above molten steel or dipped into the steel. In general, these showed that if the coating did not crack on drying, further cracking at high temperatures was determined by the cracking tendency of the underlying sands. The good performance of sodium alginate washes was confirmed.

In a final series of tests various coated cores were incorporated in

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Circle 652 on Page 55

a test mold in which they were surrounded by molten steel under air pressure corresponding to a head of about 8 ft of molten metal. Only thick coatings of very refractory materials were able to prevent metal penetration. Reactive materials such as olivine or titania were completely ineffective.

Sodium Silicate Binder—M. B. Pajevic and J. Kruspel (Jugoslavia—written in German) discussed the development of sodium silicate bonded sands which without CO_2 treatment were intended to combine good molding properties with better knockout characteristics than those of CO_2 hardened mixtures.

Results were tabulated on 14 mixtures, based generally on silica sand, containing sodium silicate and bentonite. The best combinations contained 5 per cent sodium silicate, 4 per cent bentonite, 1 per cent of a 30 per cent caustic soda solution, and 1 per cent of molasses or of mazut (translation of "mazut" uncertain), which was very plastic and remained so for ample time to make large molds. It hardened sufficiently on standing to produce satisfactory molds and the knockout properties after casting were excellent.

Metal Flow—Metal flow in gating systems as an aid to casting technique was the subject of a paper by M. Bednarik (Czechoslovakia—written in German). It was first shown that transparent models could be used to establish simply and cheaply the hydraulics of flow in similar metal running systems in the foundry. The effectiveness of saw tooth slag traps was then studied by introducing cork particles into water. Effectiveness was found to depend on the square root of the particle size and on the speed of flow, confirming the applicability of the laws of hydraulics.

The third part of the paper dealt with means of securing quiet uniform flow of metal into a turbine blade mold where fluctuations in the metal surface lead to the formation of oxide skins and cold shuts. Transparent models using water and mercury produced the desired result and it was noted that changes in viscosity were not of importance.

Automatic Operations—W. Gotz (Switzerland—in German) described the policy of the George Fischer Co. in regard to the Buhrer automatic plants which have aroused so much interest. The first plant at Schaffhausen incorporated two 3-station automatic molding machines, one making copes and one making drags, with special arrangements for uniform compaction of the backing sand, mechanical handling of rammed flasks, fully automatic pouring and knockout. It also included arrangements for standardizing running systems, arrangements for rapid changing of portions of pattern plates, and improved methods of sand cooling. The second plant at Mettmann followed the same general principles with somewhat larger flasks and other improvements.

The third plant, now being constructed at Singen, shows several changes in these principles. Instead of two 3-station molding machines, only one machine of six stations produces copes and drags alternately. Flasks are larger, being about 25 x 35 in. against approximately 22 x 27 in. at Mettmann and 21 x 26 in. at Schaffhausen.

Output of the Singen plant should be about 70 per cent higher than that of the Schaffhausen plant. The capital cost is calculated to be substantially lower in relation to output and the labor costs to be proportionately still lower.

Low-Phos Castings—N. G. Chakrabarti, U. K. Bhattachara, B. K. Gupta, and N. R. Mitra (India—written in English) described their practice for making brake drums and similar low-phosphorous iron castings from a steel scrap charge in an electric arc furnace. Preliminary experiments in a 100-lb arc furnace indicated the desirability of first melting the iron to a carbon content of 2.2 to 2.6 per cent, followed by later carburization with coke to a content of about 3.25 per cent and final inoculation with ferrosilicon at about 2600° F to a level of 2.1 per cent.

This practice was found to give higher strength and better microstructure. Details were given of minor modifications in composition to suit other castings and of the inspection and quality control procedure.

(Other technical reports will be presented next month.)

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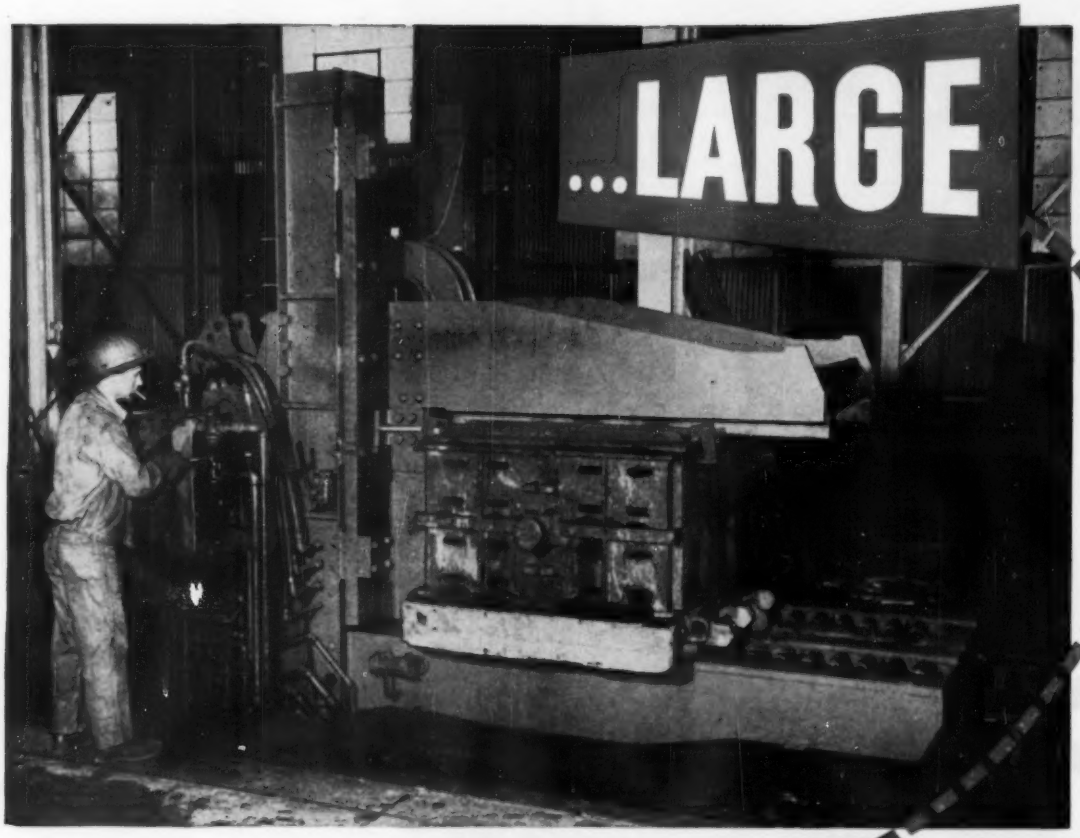

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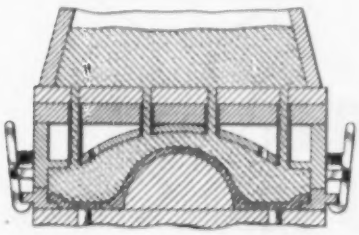
PATENTS of Interest to Foundrymen

Shell Molding

This patent covers production of a shell mold by placing the resin-sand mix on the hot pattern, and then pressing a contoured plate against the sand to reduce the thickness of the shell 20 to 25 per cent. The contoured plate may be hot or cold; if cold, the assembly must be placed in an oven to polymerize or cure the resin.

After the shell mold is cured, the contour plate is removed and the



shell mold and its supporting pattern is enclosed in a flask. The flask may be partially contoured and contains suitable blow tubes. Green sand is blown through the tubes into the space between the shell mold and the contour flask, and forms the supporting or backing means for the relatively thin shell mold. *Patent No.* 2,945,272 *granted to A. L. Boegehold and assigned to General Motors Corp.*

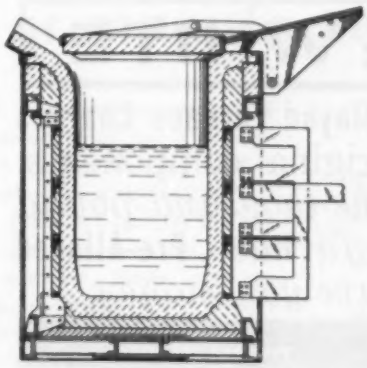
Hot Metal Dispenser

Method and apparatus for dispensing metal by pressure includes a double chamber furnace, means for separately heating the chambers, means for supplying compressed air to one chamber, and an angularly mounted nozzle for ejection of the molten metal. One of the chambers approximately twice the size of the other is partially open to the atmosphere, and connected to the smaller by a small orifice. Large chamber melts the metal and supplies it to the small chamber through the orifice. Small chamber, containing the nozzle, is sealed with a tight cover, and compressed air is admitted at controlled intervals to force the molten metal from the nozzle into a mold or other container. Time that the chamber is subjected to pressure also is controlled so that definite quantities of metal are delivered from the nozzle. Chambers are heated by electromagnetic induction units. *Patent No.* 2,936,326, *granted to M. Tama and assigned to Ajax Magnethermic Corp.*

Induction Furnace

Increasing melting speed of metal parts having large surfaces such as chips or foil in the electric induction furnace is accomplished through a divided primary coil. The coil is divided into upper, center, and lower sections which are connected to switching means so that they may be energized fully, partially, or not at all as the melting conditions may require.

Initially the lower coil section is energized to melt the charged ma-

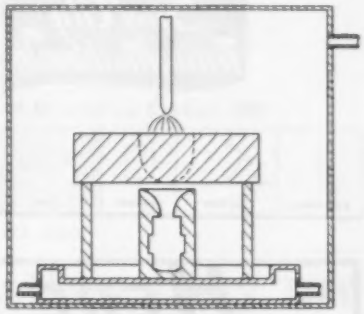


terial; as additional material is added the middle section and finally the top section are energized. As the top section is energized, the power to the other coil sections is decreased to a point just sufficient to keep the charge molten. Under those conditions there is a strong downward flow of the solid metal additions into the molten charge where they are melted. *Patent No.* 2,946,834 *granted to Otto Junker and assigned to Otto Junker.*

Casting of Metals

Procedure for melting and pouring metals such as titanium and zirconium which have a great affinity for oxygen and nitrogen and tend to react with most refractory materials, is claimed to overcome difficulties encountered in other methods.

Practice includes use of a block of the metal to be cast which is supported above the mold containing the casting cavity. An arc is



struck between the electrode, which may be consumable or inconsumable, and the block of metal. Heat energy is supplied at a high rate to form a narrow, deep pool of molten metal before the outer portion of the block becomes hot enough to melt. Molten pool is superheated, and then the power is increased sufficiently to melt through the solid metal at the bottom so that the metal flows into the mold.

Melting and casting can be conducted under a vacuum or in an inert atmosphere. *Patent No.* 2,946,105 *granted to A. R. C. Westwood and assigned to Imperial Chemical Industries Ltd.*

Vacuum Casting Method

Stream degassing of molten metal under a vacuum is most effective when the molten metal stream is as thin as possible so as to present a large surface. Difficulty is encountered in obtaining thin streams due to the tendency of metal to solidify in small passages unless they are

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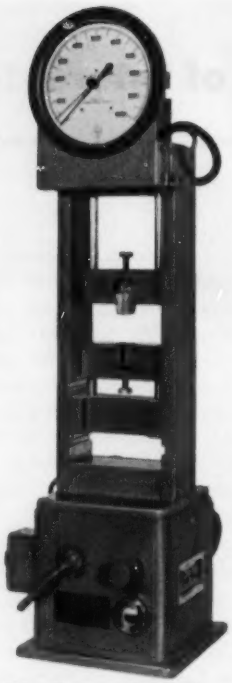
Write or call if you have any special testing problem



These machines are designed to also perform compression tests.

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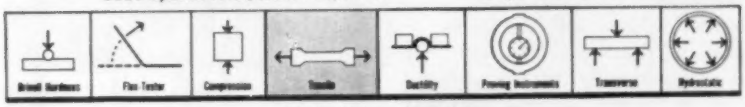

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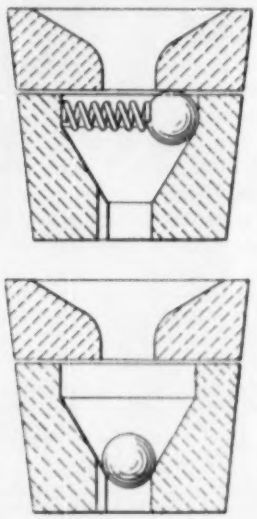
raised to a high temperature. In a patented process this is accomplished with the nozzle shown.

Constructed of refractory, the nozzle contains a spherical refractory member or ball which is held in the raised position by a metal spring or other means. Shortly after the molten metal enters the nozzle, the temperature of the latter is raised to a high degree, and the spring

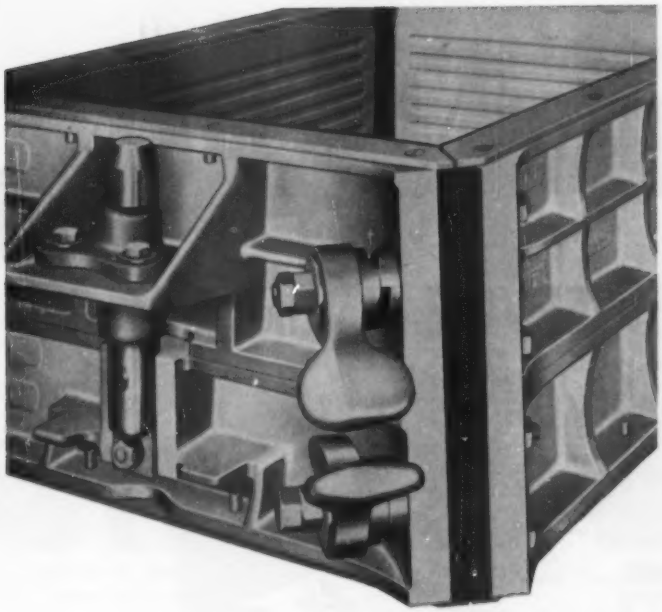


melts. That permits the ball to drop and close the passage except for a narrow slot along one side. This narrow slot provides the desired thin stream of metal for the degassing operation. *Patent No. 2,946,101 granted to B. L. F. Lilljekvist and L. O. Uhrus and assigned to Aktiebolaget Svenska Kullagerfabriken.*

Molding Additive

In investment casting of carbon-containing alloys there is a tendency for surface decarbonization. According to this patent, that condition can be overcome by incorporating in the molding medium a combustible substance such as an alkaline earth metal carbide or cyanide. About 2 to 8 per cent of the molding mixture is composed of the protective material.

Calcium carbide, cited as one example, is claimed to withstand the usual practice of heating the mold to high temperature, but it reacts with any oxygen when molten steel is poured into the mold, thus preventing decarburization. *Patent No. 2,948,034 granted to H. Schneider and assigned to Sulzer Freres S.A.*



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The Fremont Flask Co., Fremont, O.

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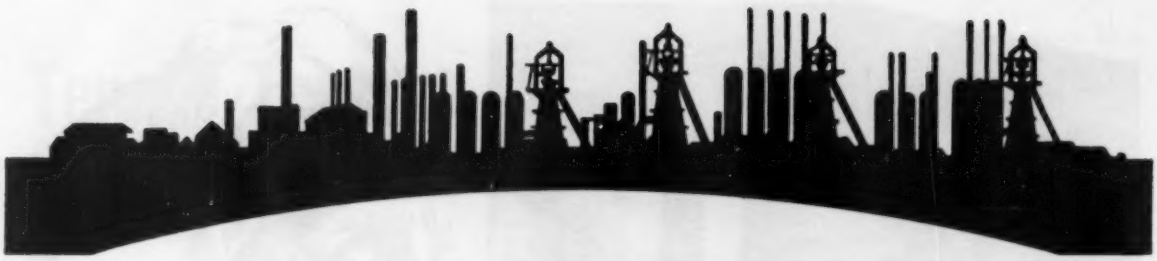

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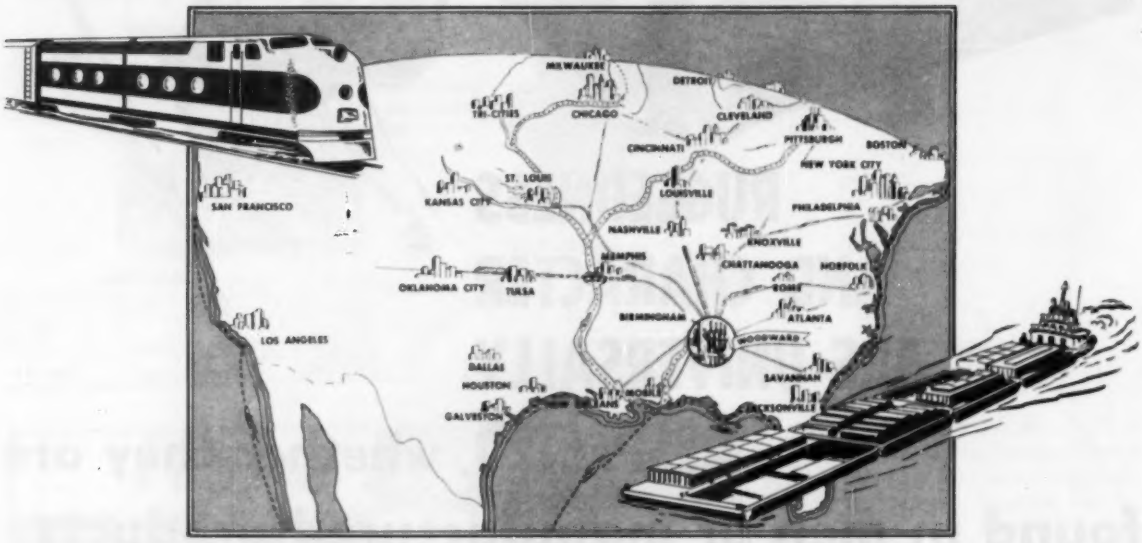

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ROBERT F. STEWART
. . . Joy Mfg. Co. v. p.

EDWARD P. SANDBACH
. . . becomes manufacturing mgr.

MARTIN N. LINDSAY
. . . coke-pig iron sales

Clifford M. Apgar has been named manager of shop operations at the General Electric Co. Specialty Foundry, Schenectady, N. Y. Until recently he was works manager and vice president of operations at Adirondack Steel Casting Co., Div. of Consolidated Foundries & Steel Inc., Watervliet, N. Y., which he joined in 1950.

Bernard M. Korn has been named treasurer, American Steel Foundries, Chicago. **L. T. Moate,** formerly vice president-treasurer, will devote full time to his duties as vice president in charge of the company's finance and legal division. **F. B. Van Buskirk,** chief accountant, succeeds Mr. Korn as assistant treasurer.

Jules C. Laegeler, formerly chief engineer, has been appointed vice president in charge of engineering, Frank G. Hough Co., Libertyville, Ill. He joined the company in 1951. **Keith W. Kampert** has been named chief engineer, product design, and **Thorvald Granryd,** chief engineer, research and development.

L. R. Burger has been elected vice president in charge of sales, Logansport Machine Co., Logansport, Ind.

Charles E. Nelson, executive vice president, has been named president, Waukesha Motor Co., Waukesha, Wis., succeeding **James E. De Long,** who has retired. Mr. De Long continues as a director.

Robert F. Stewart has been elected a vice president of Joy Mfg. Co., Pittsburgh, and general manager of the Western Precipitation Div., Los Angeles. He was assistant general manager and a vice president of the division.

Lucien Williams has been named manager of the St. Louis office, National Malleable & Steel Castings Co., Cleveland, succeeding **Howard Stark,** who has retired after 40 years with the company. **Glenn G. Tenney** becomes manager of the Philadelphia office. **Russell J. Wittmer,** former Philadelphia manager, also has retired.

J. Walter Wallace has been named general sales manager of National Bearing Div., American Brake Shoe Co., New York, with headquarters in Meadville, Pa. **George H. Bailey** has been appointed western sales manager for the division. He will be based in Oakland, Calif.

Norman A. Lougee has been named secretary and a director, and **Gilbert J. Marsh,** treasurer, Chicago Faucet Co., Chicago. **Harry E. Teichen,** former secretary-treasurer, has retired but will continue as a director and consultant.

Edward P. Sandbach, formerly chief metallurgist, has been appointed manager of manufacturing, Mackintosh-Hemphill Div., E. W. Bliss Co., Canton, Ohio. He will be in charge of operations at the division's Pittsburgh and Midland, Pa., plants.

Martin N. Lindsay has been named to head sales of coke and pig iron for Crucible Steel Co. of America, Pittsburgh, in addition to his duties as manager of raw materials.

William Butler III has been named a vice president of Bell Intercontinental Corp., South Bend, Ind. Last year he joined Wheelabrator Corp., Mishawaka, Ind., a Bell subsidiary, as administrative assistant to the president and continued in a similar capacity with the parent company in July.

Thomas F. Mackey has been named eastern regional manager of General Electric's industrial sales operation, with headquarters in New York. He joined the company in 1937 and recently was manager of the industrial commercial section of the user industries sales department.

James L. Miller has been transferred to Norton Co.'s Refractories Div., San Francisco. **John A. Trogolo,** product engineer at the

CARL KILIAN
. . . Albert Lea sales

J. JAMES OFFUTT

H. L. BEYNON

JACK W. SWATEK

. . . new appointments at Green Fire Brick Co.

company's Worcester, Mass., plant, succeeds Mr. Miller as refractories engineer in Chicago. **Robert T. Hale,** who recently completed the refractories sales training course, has been assigned to the Indianapolis area.

Carl Kilian has been appointed a sales engineer for the Albert Lea Foundry of Queen Products Div., King Seeley Corp., Albert Lea, Minn., to cover eight western states. He was with the Central Specialties Div. of King Seeley in Ypsilanti, Mich.

Robert S. Reimers, formerly with Wheelabrator Corp., Mishawaka, Ind., recently joined Foundry Services Inc., Cleveland, as a technical sales representative in northern Illinois and Iowa.

J. James Offutt has been appointed vice president and general manager, A. P. Green Fire Brick Co., Mexico, Mo., in charge of manufacturing, sales, research and engineering. **Jack W. Swatek** has been named director of sales, and **H. L. Beynon,** general sales manager. **W. Ferris Mundy** was made plant manager at Mexico, and **W. D. Clark** will manage all other company plants.

R. William Rosenquest, sales representative for metal and alloys, New Jersey Zinc Co., New York, has been named manager of metal sales, eastern division. **Charles H. Prince,** technical service representative, has been appointed manager of technical service, metal division.

George E. Miller has been named manager of field sales and marketing, C & S Products Co., Detroit, affiliate of Barber-Greene Co., Aurora, Ill. **David Spinner** has been named chief engineer. Mr. Miller was sales manager for Osborn Mfg. Co., Cleveland, and until recently was divisional sales manager for mold and coreblowing machines, Beardsley & Piper Co. Div., Pettibone Mulliken Corp., Chicago. Mr. Spinner was formerly with Ford Motor Co.'s engineering department.

J. G. Weaver is retiring at the end of December as sales manager of Eastern Malleable Iron Co., Wilmington, Del., after almost 50 years with the company.

Arthur Kaufmann has been named assistant general manager, Kuhlman Electric Co., Bay City, Mich., in addition to his duties as vice president-treasurer.

Lloyd C. Graham has been appointed western regional sales manager, Devcon Corp., Danvers, Mass., succeeding **Richard L. Rouviere,** who becomes eastern regional sales manager.

H. Brown Reinhardt has been named eastern sales manager for the American Manganese Steel Div., American Brake Shoe Co., New

ROBERT S. REIMERS
. . . joins Foundry Services

GEORGE E. MILLER

DAVID SPINNER

. . . appointments at C & S Products Co.

LLOYD C. GRAHAM
. . . Devcon regional sales mgr.

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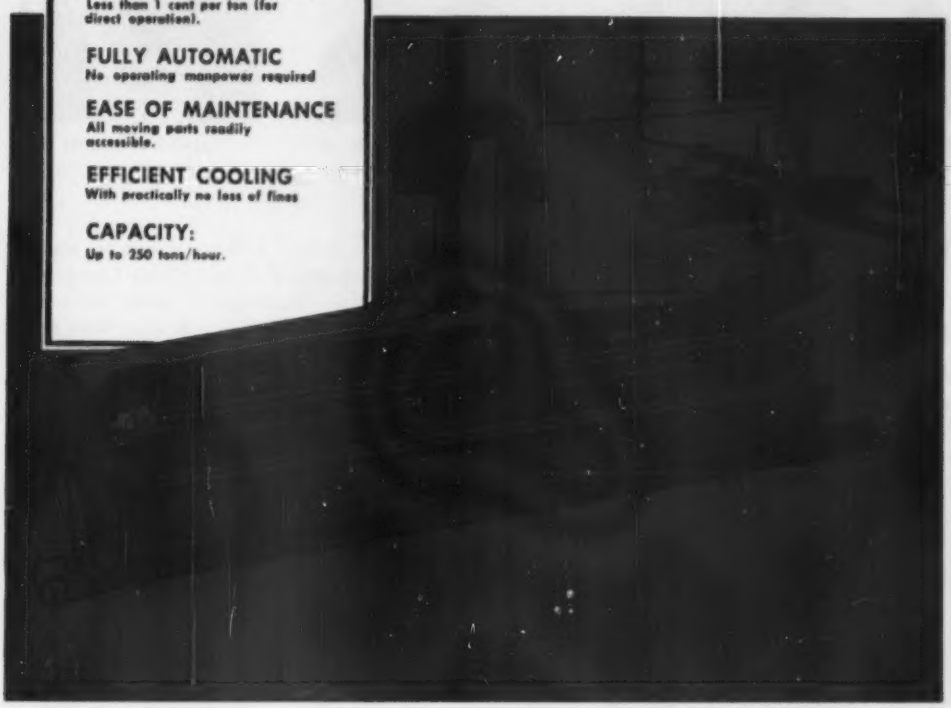
CAPACITY:
Up to 250 tons/hour.



Save by reducing casting defects.

Save by reducing the use of parting agents.

No loss of "Fines".

No loss of re-usable binder.

Save on binder additions.

Much better control of sand properties at the mill and at the molding stations.

Save on maintenance cost.

Better working conditions.

Perfect control of molding sand properties is an absolute necessity for any successful molding operation.

Strength, permeability, flowability, etc., must be accurately controlled in the mixing unit and, equally important, these properties must be stable to insure uniformity at the molding stations.

Only the use of a cool sand guarantees stability. Variations in sand properties, caused by varying evaporation of the moisture, are eliminated.

The use of hot molding sand not only causes control loss of sand properties at the molding stations, but is also directly responsible for many casting defects.

IAC

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Gentlemen: Please send me, without any obligation on my part, a free copy of your bulletin SC-80.

NAME ..... TITLE .....

COMPANY .....

ADDRESS .....

Circle 659 on Page 55

WINTON A. VAGEDES
. . . Norton Co. district mgr.

MARQUIS P. ORR
. . . becomes general sales mgr.

EDWIN A. SCHLOTZHAUER JR.
. . . heads Texas Chapter

ALFRED S. HARRIES
. . . B & W sales rep.

York, succeeding **E. J. Nist,** who will continue to represent the company in the Southeast. Mr. Reinhardt's headquarters will be at the New Castle, Del., plant.

Winton A. Vagedes has been named Cleveland district manager of Norton Co.'s Abrasive Div., succeeding **Cheever H. Ely,** who has been assigned to New England. **Jack M. Esten** takes over the former duties of Mr. Vagedes as abrasive engineer in the New Jersey area. **Karl E. Krogstad** succeeds Mr. Esten as abrasive engineer in Philadelphia.

Lloyd H. Strausz recently joined Sipi Metals Corp., Chicago, as manager of the Detroit district office.

Charles E. Reichel has been appointed Chicago district sales manager, Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati, succeeding **George E. Parker,** who becomes assistant sales manager of the division. Mr. Reichel was a sales representative in the Chicago office.

Marquis P. Orr, formerly manager of roll sales, has been named general sales manager of the Mackintosh-Hemphill Div. of E. W. Bliss Co., Pittsburgh. He will be responsible for sales of rolls, lathes, straightening machines, cinder pots, and castings produced at the division's plants in Midland, Pa., and Pittsburgh.

Richard A. Lowe, formerly with Baldwin - Lima - Hamilton Corp., Philadelphia, has joined Baird-Atomic Inc., Cambridge, Mass., as general sales manager in charge of domestic and export sales for all commercial products.

John E. Krickl has joined Lindberg Engineering Co., Chicago, as western district sales manager, with headquarters at the company's Downey, Calif., plant.

Edwin A. Schlotzhauer Jr., elected chairman of the Texas Chapter of the American Foundrymen's for 1960-61, for 12 years has been plant superintendent, Federated Metals Div., American Smelting & Refining Co., Houston. He joined the Whiting, Ind., plant in 1942, and later was transferred to Pittsburgh.

Alfred S. Harries, formerly refractories sales representative in the New York office, Babcock & Wilcox Co., Pittsburgh, has been transferred to refractories sales in the Pittsburgh office.

John D. Zurcher has been appointed general sales manager, Kensington Steel Div., Poor & Co., Chicago. He was in the New York office.

C. L. Wasem, foundry superintendent and treasurer, Century Brass Works Inc., Belleville, Ill., recently marked his 43rd year with the company. He has been foundry

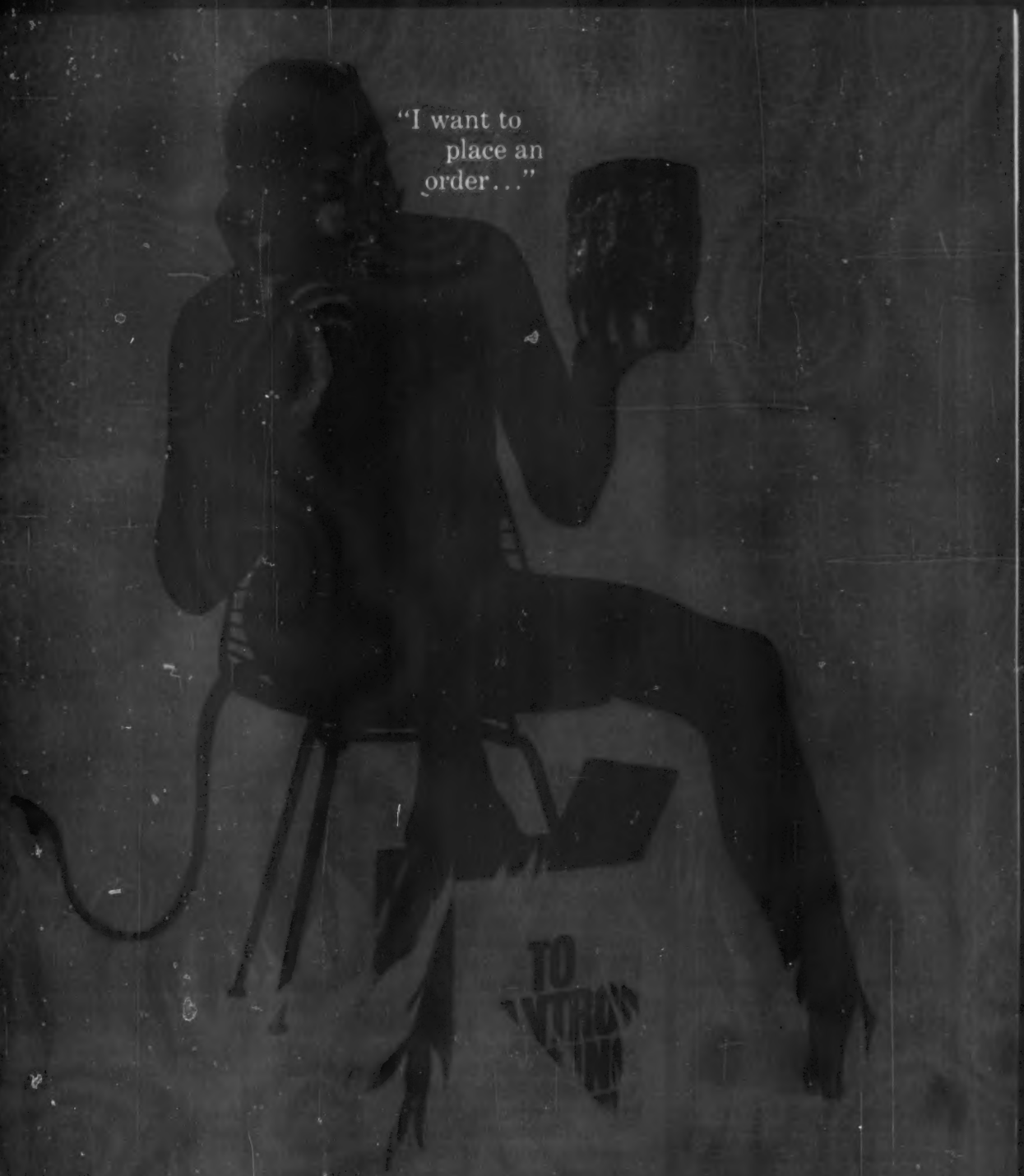
CHARLES E. REICHEL

GEORGE E. PARKER
. . . Cincinnati Milling Products Div. promotions

JOHN E. KRICKL
. . . Lindberg district mgr.

C. L. WASEM
. . . Century Brass officer

Circle 660 on Page 55→



Smart fellow — that Satan! He's found out our Koppers Premium Foundry Coke maintains a higher temperature range and keeps operating costs way down. Naturally he wants to order some.

But we wouldn't sell him. We sell only the *good* guys. We've found that once we have sold them — they *stay sold* and remain good customers of ours forever and ever.

The reasons are quite simple: Koppers Coke is prepared from the very best quality West Virginia coals, skillfully blended and baked the right length of time. It is absolutely uniform in *size, strength, structure* and *chemical analysis.* (We check each day's run to be sure.) And because of its superior physical qualities, its high carbon and low ash, Koppers Coke enables foundrymen to maintain higher temperatures which increases the cleanliness of the iron and helps cut fuel consumption.

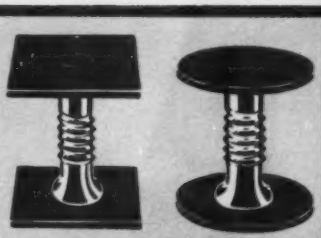
Just for the devil of it, why don't you make your next order Koppers Premium Foundry Coke? It's available anywhere in the U. S. or Canada in sizes to fit your needs. Koppers Company, Inc., Pittsburgh, Pennsylvania.

Koppers Premium Foundry Coke

Choose CLEVELAND CHAPLETS for Casting Consistency!

Cleveland Radiator Chaplets — include both popular open flat coil head and regular plate heads ... in all styles and finishes.

Motor Chaplets — made with annular fusion rings for uniform knitting and maximum core support; also with wide radius shoulders that eliminate gas-collecting voids under the heads.



Double-Head Chaplets — used for heavier metal sections, these chaplets are accurately made of low carbon steel and carefully tinned. Also produced in heavy and extra-heavy sizes.

Square Super Chills and Regular Curved Chills — accurately equalize cooling rates of thick and thin casting sections ... eliminate shrinks. Complete line ... black, copper or tin coating.

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Circle 661 on Page 55

JOSEPH H. McGRAW

DANIEL A. HACKETT

. . . Vanadium Corp. promotions

superintendent for 37 years and treasurer for 20 years. The company manufactures drinking fountains and water coolers as well as nonferrous castings.

Charles G. Chisholm, since 1956 general sales manager, has been named vice president of marketing, Haynes Stellite Co., Div. of Union Carbide Corp., New York. He joined the company in 1933.

Louis Hayden has joined Greenlee Foundries Inc., Chicago, as special consultant. Mr. Hayden was manager of the former foundry division of Koehring Co., Milwaukee.

Albert P. Mueller has been elected executive vice president and a director of Milwaukee Solvay Coke Co., Milwaukee. He was vice president of operations.

John Hood has been appointed general manager of Grand Rapids Foundry, Div. of Oliver Machinery Co., Grand Rapids, Mich.

John Chahbandour has been appointed a partner of Nelson Engineering Sales Co., Pittsburgh sales representative for W. W. Sly Mfg. Co., Cleveland. He was sales manager of Carrier Conveyor Div., Chain Belt Co., Louisville.

Carl M. Kaltwasser, formerly assistant district sales engineer in the Pittsburgh area, Jervis B. Webb Co., Detroit, has been named district sales engineer in the Buffalo territory. **Thomas B. Longan** recently joined the company as sales engineer for the Bulk Systems Div. in Cleveland.

Joseph H. McGraw has been appointed eastern district manager, Vanadium Corp. of America, New York. **Daniel A. Hackett**, formerly in the Cleveland office, succeeds Mr. McGraw as assistant district manager in Detroit. **George H. Abel** has been made eastern district representative. Messrs. McGraw and Abel will be situated in New York.

George H. Truman, formerly with Illinois Clay Products Co., Chicago, has joined Vince Bruce Inc., Indianapolis, as foundry supplies sales representative in Indiana, with headquarters in South Bend.

Herbert L. Tygesson, formerly with American Pulley Co., Philadelphia, has been appointed general sales manager, Automatic Transportation Co., Chicago, succeeding **R. D. Jones**, resigned.

Henry J. Lang, formerly representative in the Michigan area, has been transferred to the Pittsburgh office of Acheson Colloids Co., Div. of Acheson Industries Inc., Port Huron, Mich., to cover western Pennsylvania and West Virginia.

Francis J. Shank, formerly vice president-general manager, Davis Castings Co., Newcastle, Ind., has joined Swayne, Robinson & Co., Richmond, Ind., as sales consultant.

Edward Fiore and **Peter Magruder** have been appointed sales engineers in New York and Philadelphia, respectively, for the Welding Products Div., A. O. Smith Corp., Milwaukee.

Obituary

John A. Burke, 66, owner of the former Wisconsin Grey Iron Foundry Co., Milwaukee, died Nov. 1. After graduation from University of Maine in 1917, he joined Chain Belt Co., Milwaukee, where he became head of foundry sales. In 1922 he organized his own company which made large castings for the automotive and machinery industry until it was liquidated in 1959.

Raymond Smith, 57, superintendent of Salem Iron Works, Salem, Oreg., was killed in a plane crash there Oct. 25. **Robert E. Wicen**, 39, manager of conveyor component sales in the Conveyor & Process Equipment Div., Chain Belt Co., Milwaukee, and **Wilbur Church**, 50, Portland, regional manager for Chain Belt, also lost their lives in the crash.

Edwin N. Hanlon, 82, former president and chairman of the board of directors, Newaygo Engineering Co., Newaygo, Mich., died Oct. 7. With the company for 50 years, he had been in partial retirement recently as an engineering consultant for Newaygo.

T. W. Ballard Sr., 57, founder and owner of Idaho Falls Foundry, Idaho Falls, Idaho, died Oct. 7 in Salt Lake City, Utah. He started the company in 1932.

Forrest J. Gartside, 65, president of Diamond Clamp & Flask Co., Richmond, Ind., died Oct. 7.

Oke P. Cook, 54, sales engineer, Cortland Grinding Wheels Corp., Chester, Mass., died at his home in Olmsted Falls, Ohio, Oct. 29.

Max H. Sorenson, 65, owner of Sorenson Industries Inc., Darby, Pa., manufacturers of rings, castings, and pump parts, died recently.

Stanley J. Sweeney, 54, assistant office manager, American Steel Foundries, Chicago, died Oct. 28.

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Here in 120 carefully planned pages is a complete Cost Account System for both a small foundry with minimum accounting facilities and a large foundry capable of detailed cost determinations for accuracy and completeness.

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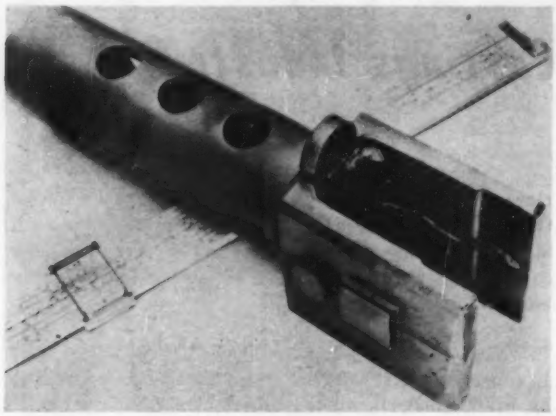
The Shakeout

Weapons Components Are Precision Cast

COMPONENTS for weapons such as the new M-85 machine gun are being produced by the United States Army Arsenal, Watertown, Mass., with the Shaw process. This process was selected over several others because rough machining is eliminated. The gun barrel support for the M-85 shown here is 18 in. long and weighs about 15 lb. Other parts, including a breech ring for a 900-lb, 105-mm tank rifle, are being prepared for production by the Shaw process.

Advantages of the process derive from the ceramic



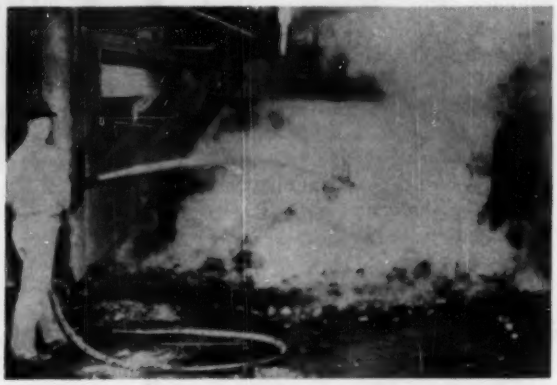
material used to make the molds. The mold surface contains microcrazing which allows the material to expand without mold distortion and provides vents for any gases to escape. Watertown Arsenal is licensing the casting technique from Shaw Process Development Corp., division of British Industries Corp., Port Washington, N. Y.

For More Details Circle No. 497—Page 55

Brick Flooring Withstands Severe Test

MOLTEN METAL and slag dumped from four cupolas in the foundry of a major automobile manufacture have tested a brick floor material over a period of years. Originally, 25,000 bricks were laid for the floor around the cupolas. Over a four-year period, only 500 replacement bricks were required to maintain the floor in good condition. The bricks, manufactured by Walter Maguire Co., New York, N. Y., are laid on edge without mortar, giving a floor with a thickness of 2¼ in.

The bricks must withstand thermal shock from dropping the charge as each cupola is shut down for repairs. Three of the cupolas are used each shift while the fourth is being repaired. When the cupola bottom is dropped, molten metal, slag, and red-hot coke are dumped onto the floor and cooled by a water spray so the mass can be hauled away. Additional



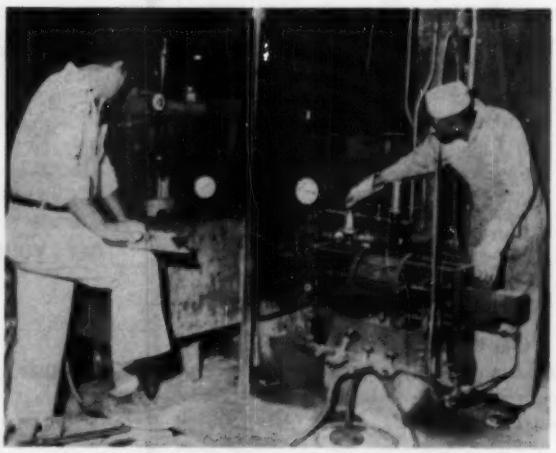
abuse comes from molten iron overflowing from pouring ladles and from slag spilled as it is emptied from the cupolas during their operation.

For More Details Circle No. 498—Page 55

High Pressure Tests Prove Casting Soundness

HYDROSTATIC TESTING of nonferrous castings at high pressure is an essential operation at Philadelphia Brass & Bronze Corp., Philadelphia. More than 50 per cent of the firm's customers specify that their castings must be tested hydrostatically at pressures averaging between 2500 and 5000 psi.

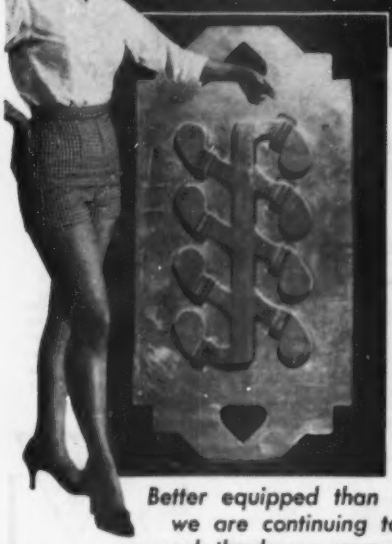
Test equipment consists of a double-acting, air-driven



hydraulic pump, a universal clamping table, and a high-pressure test stand for small castings. The hydraulic pump was made by Aldrich Pump Co., Allentown, Pa., and develops hydraulic pressure from 50 psi to a maximum of 12,100 psi. It is operated by 90-psi plant air and is the sole source of hydraulic pressure for testing castings. Up to 30 simple castings can be tested per hour.

For More Details Circle No. 499—Page 55

SCIENTIFIC
PRESSURE CAST
MATCHPLATES



"BUILT WITH EXTRA CARE"

Not a single matchplate leaves the Scientific Plant without rigorous 7-point inspection.

Better equipped than ever before, we are continuing to progress and thank our many customers.

THE SCIENTIFIC CAST PRODUCTS CORP.
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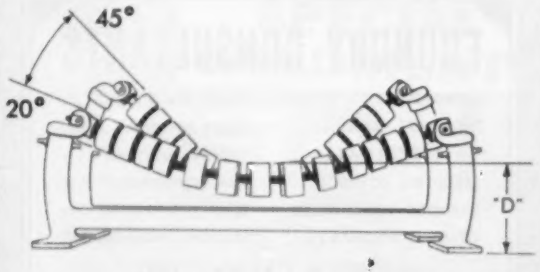
Circle 663 on Page 55



How about increasing the capacity of your conveyor system 26%? Without expensive belt construction, that is?

Install this new, adjustable Limberoller Idler Bracket, the VARYTROUGH. It adjusts from 20° to 45° . . . and the "D" dimension remains the same! Because it adjusts so well to deep troughs at loading points, it eliminates spillage and wandering belts due to off-center loads. The adjustable VARYTROUGH is a development of the Florida Conveyor & Equipment Co., Mulberry, Florida. We are specialists in conveyors, elevators, and feeders. Tell us about your conveyor problems; it is very likely that we can help you.

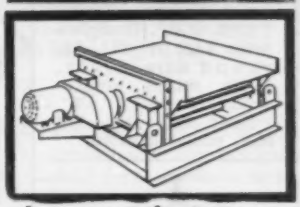
FLORIDA CONVEYOR & EQUIPMENT CO.
MULBERRY, FLORIDA

Circle 664 on Page 55

NON-FLUID OIL
TRADE MARK REGISTERED

Does Not Dry Out Like Ordinary Grease . . .

But Lubricates Indefinitely Until Consumed



In foundry shake-out and screen operations, NON-FLUID OIL never loses its lubricating properties. Specifically designed to "stay alive" longer in bearings, it efficiently protects despite age, heat and exposure.

NON-FLUID OIL will always remain free from acid . . . thus there is no danger of pitting and discoloration of ball and roller surface bearings. Because it is viscous and clinging, it forms a protective seal around the bearing ends, effectively barring the entrance of grit and sand. You will find, also, that NON-FLUID OIL lasts three times as long as other lubricants.

Proof of the lubricating efficiency of NON-FLUID OIL is that the majority of manufacturers of shake-outs and vibrating screens use and recommend it for insuring uninterrupted service and longer life of bearings. But convince yourself . . . send for a free testing sample and Bulletin 559.

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Combs Gyratory Riddles

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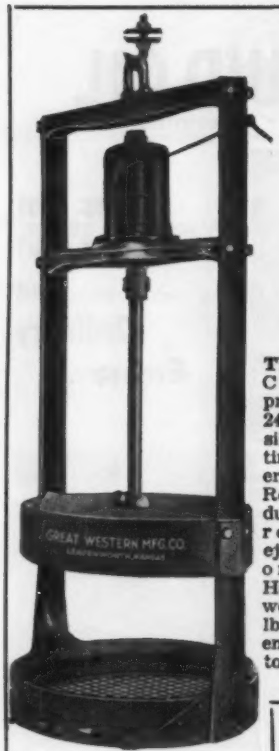
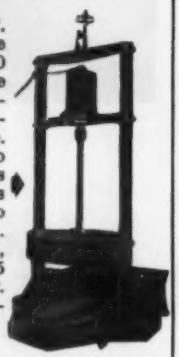


TYPE "CS". Complete price $435.00 24" square sieve. A continuous operation sieve. Requires no dumping, as refuse is ejected off to one side. Height 4'10", weight 295 lbs, ⅓ H.P. enclosed motor.



TYPE "HL". Price $315.00 complete, less sieves. Laboratory model especially designed for laboratory sand control, fitted with 1/6 H.P. enclosed motor.

PROMPT DELIVERY from your Foundry Supply House

TYPE "CR". Complete price $425.00. 24" dia. round sieve. Sifts, fluffs, mixes, aerates sand. Height 4'6", weight 250 lbs., 1/3 H.P. enclosed motor.

TYPE "V". Price, 20" Sieve, $330.00. Does the work of 10 men. Screens sand, Fine, Medium, and Coarse. 20" dia. sieve with special clamp for 5-second changes. Height 4'6", weight 100 lbs., fully-enclosed 1/6 H.P. motor. Also available in Giant V-5 with 36" sieve for triple capacity . . . Price $600.00.

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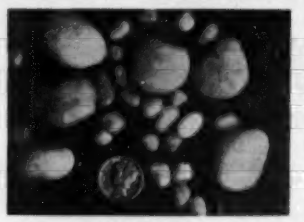

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Circle 669 on Page 55

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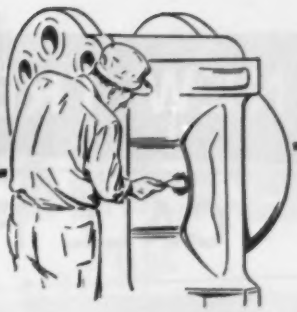

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When correcting blow or sand holes, surface blemishes, or rough and porous areas in castings, you can depend on Smooth-On Foundry Cements, standard of the industry for more than 63 years. They are easy to apply, harden quickly, stay firmly in place.

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With 3 different shades to pick from, you know you can get a close match for your castings.

4AA—Light gray, fine texture
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UNIFORM QUALITY

Rigid quality control means you can be sure that the strength and color of Smooth-On Foundry Cements will not vary from one order to the next. Every lot of Smooth-On cements is laboratory tested and must satisfy tests for setting time, hardness, and color before it is packed for shipment.

FREE SAMPLES

Why not try one or more of these Foundry Cements at our expense? We will be glad to send you a free sample of any of the cements described above if you will write us on your business letterhead. Write today, and see how Smooth-On can improve the appearance of your castings.

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SMOOTH-ON
FOUNDRY CEMENTS

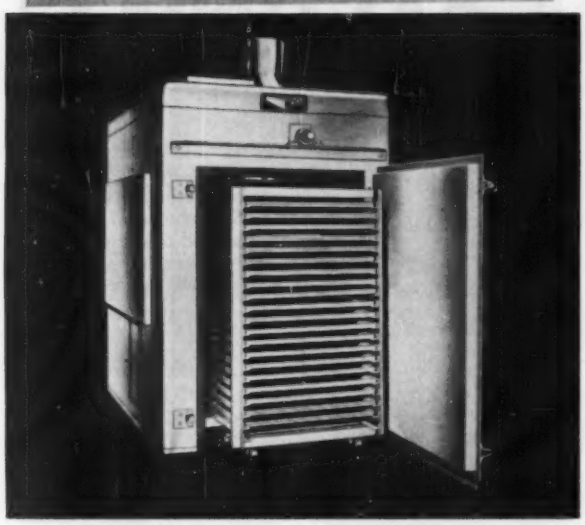
SO-369

Circle 672 on Page 55

NEW TRENDS

CALL FOR

NEW METHODS



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PATTERN LACQUERS

1. Seals pattern to prevent moisture and water absorption.
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Circle 673 on Page 55

Circle 676 on Page 55

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Homer Permanent Magnetic Pulleys in belt conveying systems cut costs in a multitude of metal-working operations. They automatically remove tramp iron from coke, slag, ores, foundry sand, etc . . . sort ferrous from non-ferrous parts . . . and segregate ferrous from non-ferrous materials, minerals, etc. Trouble-free with no D.C. power supply required. Homer's "Radial Pole Design" assures highest magnetic strength across entire working face of pulley for deep, effective penetration and positive control of magnetic materials.

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Homer Permanent Magnetic Drums automatically and economically beneficiate ores . . . remove tramp iron from slag, coke, foundry sand, ores, etc. . . . and separate ferrous parts from abrasive material following tumbling barrel operations. For installation at discharge end of gravity, screw or belt conveying systems and for use with tumbling barrels. Homer's "Radial Pole Design," with permanence of magnetic strength guaranteed, assures maximum effectiveness at all times.

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THE OHIO ELECTRIC MANUFACTURING CO.

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16 Spindle Speeds

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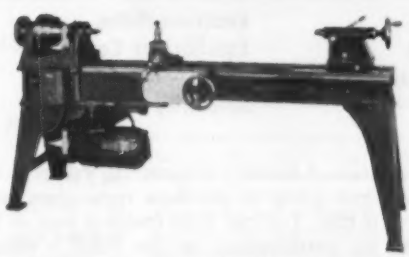
PATTERN MAKERS' LATHE



Features Lima drive unit — with single-speed motor and 4-speed transmission, to provide 16 spindle speeds! The "Oliver" No. 20, in four sizes, can be used for turning light nonferrous metals or, in modified design, for metal spinning work. Send for folder. "Oliver" Pattern Maker's Lathes are famous the world around!

OLIVER MACHINERY COMPANY

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Circle 678 on Page 55

for **plates**

. . . that stay flat

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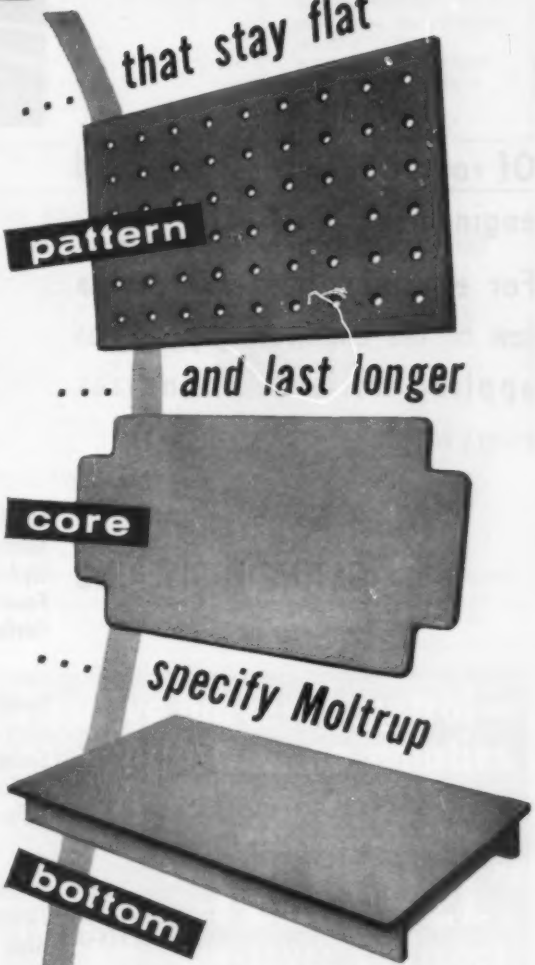

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F-2

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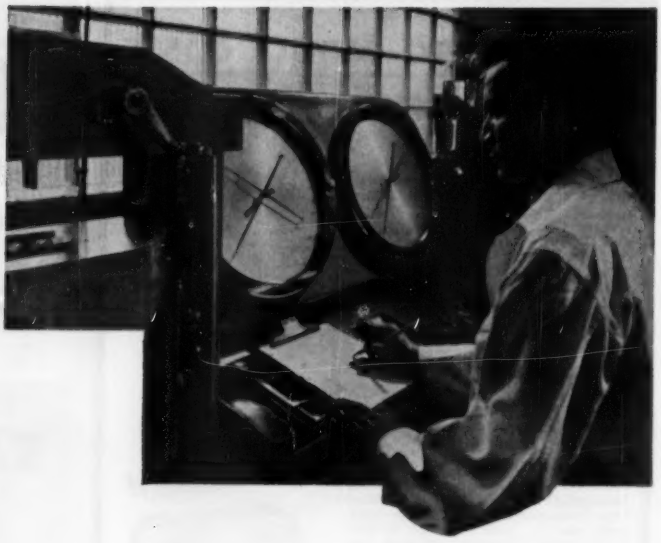

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GATING & RISERING	Fluid Flow Bernoulli's Theorem Hydraulic Principles Feeding Range Surface Tension	Solidification Nucleation and Crystal Growth Heat Transfer Temperature Gradients
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As you know, well trained foundry engineering talent is in short supply. Where are you going to get these men when you need them? The answer is this: You can help create a pool of foundry engineering talent by participating in the F.E.F.'s educational program. Write today for our booklet, "Let's Look Ahead."

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The Foundry Educational Foundation does not pay for this advertising. This space has been contributed by FOUNDRY magazine in support of FEF's constructive program for foundry industry progress through education.

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METHODS—PROCEDURES
PRODUCTION CONTROL
COST SYSTEMS

Circle 683 on Page 55

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PATTERNS for FOUNDERS, for example • • •
for a fast answer, contact:
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Circle 684 on Page 55

STEEL FOUNDRY PRACTICE

By John Howe Hall

496 PAGES 6x9 CLOTH BOUND PRICE $12. POST PAID

This book contains practical information on almost every production problem steel foundrymen encounter. The easy-to-read text is accompanied by over 250 detailed charts, drawings and illustrations.

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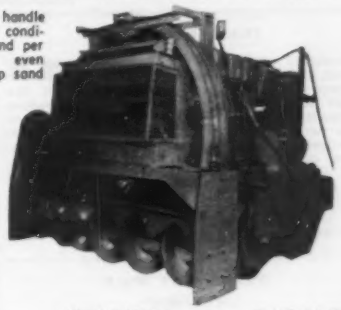
The Ringlift can easily handle many floors because it conditions up to a ton of sand per minute. It's thorough even though it's fast. Picks up sand from floor, screens, cools and aerates it. Magnetically separates metal. Moistens sand and returns it to floor in neat windrows. Clean, quiet, economical. Send for literature.



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SAND PREPARATION • MECHANIZATION • PLANT LAYOUT

Circle 687 on Page 55

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perhaps one of our **DATA SHEETS** *can suggest a solution*

For almost every spraying application, there's a Spraying Systems Data Sheet that gives useful information on suggested installations and types of nozzles to use. If you have a problem, write and let us know the application involved . . . and we'll send the Data Sheet that applies.

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And . . . for complete spray nozzle information, write for Catalog 24.

Circle 686 on Page 55

Positive bin level control— no overflows...no empties
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STEPHENS-ADAMSON
"TELLEVEL"
BIN-LEVEL CONTROLS

- Normal Duty Model for controlling flow of light to medium weight granular material.
- Pendant float-ball or float-cone operates sensitive switch to regulate level of bulk materials.
- Installed at various bin levels, the unit will start or stop flow of materials or operate signal light or horn automatically.

AVAILABLE IN THREE MODELS
• Normal Duty • Explosion-Proof • Heavy Duty

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PLANTS LOCATED IN: LOS ANGELES, CALIFORNIA CLARKSDALE, MISSISSIPPI • BELLEVILLE, ONTARIO

Circle 688 on Page 55

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JR. FOUNDRY METALLURGIST
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Promotable type young man to join rapidly expanding organization that places a great deal of emphasis on engineering proficiency. Client pays fee. Contact Paul Sheldon in confidence.

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Thoroughly experienced in foundry design and layout. A major requirement is knowledge of modern material handling equipment and material flows. Degree is required and professional registration is an advantage. This is a real opportunity with an outstanding firm offering excellent salary and fringe benefits. Send complete information on education, work history and personal data. All replies will be held in the strictest confidence.

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Good opportunity for experienced man who knows permanent mold work and can handle men, to grow with rapidly expanding aluminum foundry and product manufacturer. Replies held in confidence. Reply Box 633, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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To head plant maintenance department in a leading Eastern steel foundry. Should have at least five year's experience in foundry or steel mill field and be well versed in modern day maintenance management techniques. Mechanical or electrical engineering graduate preferred but will consider others of proper qualifications. Position is one of real challenge, offers optimum opportunity and pays well. Send detail resume to: Box 643, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Exceptional opportunity for graduate industrial engineer with a minimum of 3 years' experience capable of developing, maintaining and supervising a job cost system for the control of labor and process costs. Midwest steel foundry. Excellent working conditions. Salary commensurate with experience and background. Please furnish a complete resume of experience and education. All replies will be treated confidential.

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For steel foundry in Pittsburgh area. Experienced in the production of electric furnace steel for railroad and miscellaneous castings. Require B. S. Degree in Metallurgy and practical experience in sand control, X-Ray, and the heat treating of castings. Send detailed resume, including salary required, educational record, work experience and references. Address: Box 655, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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MAN EXPERIENCED IN CASTING SALES, SERVICE AND HANDLING CUSTOMER CORRESPONDENCE. WELL ESTABLISHED MIDDLEWEST FOUNDRY. STATE AGE. QUALIFICATIONS, PREVIOUS EXPERIENCE. BOX 670, FOUNDRY, PENTON BLDG., CLEVELAND 13, OHIO.

• HELP WANTED

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Fully qualified superintendent for large foundry producing malleable fittings and automotive and agricultural implement castings at the rate of 1,000 tons per month. Preferred age 35-45. Send full details on experience, education and family status. All replies will be held in confidence.

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Give complete details including starting salary. All replies Confidential.

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Nationally known, aggressive manufacturer of sand conditioning equipment wants dynamic representation in lower Michigan and western New York State territories. Excellent opportunities for top-flight foundry equipment salesman. Address: Box 660, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Regional or State territories available
Address In Confidence to
Mr. M. E. Prowler, Sales Manager Products Div.

TODD SHIPYARDS CORP.
Columbia and Halleck Sts. Brooklyn 31, N. Y.

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Machined, Unmachined, Plated.
For: New Jersey, New York, Philadelphia, Boston and Virginia.
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• POSITIONS WANTED

PLANT ENGINEER

Nineteen years' top experience in all phases: Methods, Plant Layout, Construction, Plant Engineering, Maintenance, Automation and Material Handling. Aggressive, personable individual seeking a strong challenge in sales or engineering. Domestic or Foreign assignment acceptable. Address: Box 635, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Young man, Engineering Graduate, sixteen years in steel foundry manufacturing and sales. Experienced in alloy steels, stainless, 17-4PH, AM 355, Monels, ductile iron and Ni-Resist castings. Qualified in aircraft and missile quality castings. Knowledge of aircraft and atomic energy specifications, Magnaflux, dye penetrant and radiographic standards. Now employed. Address: Box 664, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• POSITIONS WANTED

FOUNDRY SUPERVISOR

Young foundryman, with floor, machine molding and core room supervisory experience. Steel or iron, mechanized or otherwise. Green or dry sand molding. Versed in gating, risering, CO_2, cold set core making and production procedures. Will relocate. Address: Box 662, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

POSITION WANTED

Foreman with four years' steel foundry supervisory experience and two years industrial engineering experience desires position with a progressive foundry organization. Potential to move to superintendent. Address: Box 666, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES OR PLANT MANAGER

4 Years Apprenticeship
4 Years Chief Metallurgist
1 Year Superintendent
10 Years Sales & Advertising Management
METALS: Gray, Malleable, Nodular and all steels.
METHODS: Sand Shell and Ceramic.
Age 44, College 6 years Employed.

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Steel foundry, electric arc and open hearth furnace, acid and basic practices. Carbon, Alloy, Stainless steels. Capable of taking full charge. This includes budget and incentive systems. Address: Box 656, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Young graduate metallurgist, experienced in gray iron and steel casting foundry practice, development, and supervision wishes to relocate to West Coast. Address: Box 668, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PERMANENT MOLD DESIGNER

Good experience in design of permanent and semipermanent molds, tools and semiautomatic machines for finishing. Designs backed up by long toolroom experience. Address: Box 649, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Capable and progressive foundryman. Technical and practical experience. 18 years' experience supervising ferrous and nonferrous jobbing and production foundries. Considerable selling, customer contact, estimating, trouble shooting. Well versed in all departments. Age 46. Now employed. Address: Box 653, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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FOUNDRY SUPERINTENDENT

Technically, practically and administratively experienced in producing grey iron, ductile, malleable and steel. Presently employed. Will consider overseas assignment. Address: Box 650, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Thirty-four years' experience, ferrous and nonferrous practical and technical, twenty years' supervisor. Prefer small shop. Now employed. Age 55. Address: Box 677, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Twenty-two years in all phases of foundry operation. Journeyman moulder, jobbing and production work. Shell, CO_2 and oil sand cores. Also quotations and foundry management. Fifteen years in supervision. Will relocate. Address: Box 639, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• POSITIONS WANTED

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Aluminum and Magnesium Foundry Management! NOW AVAILABLE Foundry Superintendent of wide experience in aluminum and magnesium castings of aircraft and missile quality; exceptional zygio and X-ray records. Willing to relocate anywhere east of the Rocky Mountains. Resume on request. Not too young to take advice . . . not too old to assimilate new methods. Address: Superintendent, 4330 Encinita Avenue, Rosemead, California.

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Thorough knowledge of steel foundry and cleaning room operations. This includes inventory and budget control. Experienced as Supervisor in all departments. Address: Box 663, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PLANT MANAGER

Graduate metallurgist. Experienced in all types of ferrous foundry operations including incentives and budgetary control. Address: Box 673, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Molding Foreman wants position in steel foundry. Experience in the following: Labor, Pouring, Slinger unit. Covers 1-lb to 1,000-lb castings. Address: Box 634, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Experienced in administrative, costs and sales. Practical and technical training in Foundry operations. Address: Box 676, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Twenty years' EXPERIENCE in steel foundry. Floor molding and machine molding; Bumpers or slingers. All types castings to 20 tons. Address: Box 647, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST—SUPERINTENDENT

University graduate. Experience in high strength gray and ductile iron melting, acid or basic in water cooled cupolas, small and large castings, sand and laboratory control, scrap reduction, molding and sand control, labor negotiations, supervision. Now employed. Seeks future with progressive organization. Address: Box 672, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

With strong pattern background and proven production record through good methods, control and correct gating, seeks position in continental U.S.A. Address: Box 669, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER SUPERINTENDENT

Extensive practical experience in nonferrous foundries, jobbing and production. Know all phases of operations including permanent mold. Have good background in purchasing, customer contact, quoting, design and labor relations. Age 46. Address: Box 659, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGEMENT ASSISTANT

Thirteen years' experience in aluminum, copper, and gray iron jobbing and semi-production foundries. Experience in time studies, incentives, standard data and cost, estimating, production and purchasing. Address: Box 661, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GRAY IRON METALLURGIST

Experienced in acid and basic cupola melting, metal and casting quality control, age 49, available will relocate, mid-west. Address: Box 675, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• ACCOUNTS WANTED

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With excellent reputation and potential customers desires to represent malleable, steel and gray iron foundries in Eastern Area from New York offices. Now handling forgings, aluminum sand and permanent mold castings and allied lines. Give complete details.

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SHELL CAPACITY WANTED

For making stainless steel shell castings in 35-15 or 25-20 alloy. Rectangular tubing—various sizes . . . approximately 5" x 6" or 7" x 8"—9"-13" long—3/16" wall with small flange each end. Please quote or write

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Sand casting—permanent mold casting—centrifugal castings—in aluminum, brasses, bronzes, 30% leaded bronze—aircraft quality bearings and castings. Address: ED JENKINS, West Palm Beach, Florida. PHONE: TEMPLE 2-8685.

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USED OR BROKEN Silicon Carbide Grinding Wheels of any kind or size regardless of Bond. Will pay top price. Address: UNION MINING COMPANY, 2306 First National Bank Building, Pittsburgh 22, Pennsylvania.

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1—REDDY SANDY with Vibrating Deck

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FOUNDRY FOR SALE

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BOX 674, FOUNDRY
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Max Dia Bottom Opening 12'-6"
Distance from Eye of Bale to Bottom of Bucket Opened and Closed: 14'-0"
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GOOD USED FOUNDRY EQUIPMENT

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TERMS: 3 YEARS TO PAY

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48 x 48 Wheelabrator Tumblast	$3000.00
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4' Wheelabrator Table Blast	$2000.00
6' Wheelabrator Table Room	$6000.00
4' Wheelabrator Table Room	$3000.00
6' American Tablast	$2200.00
Rumelin 8 x 8 room	$1000.00
Pressure Tanks, all types	$150.00 up
Vapor Blast cabinets	$ 400.00

All types and sizes of Hand Cabinets, Dust Collectors, Pressure Tanks, Rooms, Horizontal or Vertical Tumbling Barrels and additional Sand Blast Equipment too numerous to mention.
$100,000 worth of Wheelabrator and Pangborn Spare Parts Priced 25% to 50% Less List.

DIAMOND SALES, INC.
5654 W. JEFFERSON
DETROIT 9, MICHIGAN
VI. 3-6750

REPAIR AND REBUILDING SERVICE ON ALL PNEUMATIC TOOLS

We try to carry a complete line of "Hard Chrome Rebuilt Tools" at about half the cost of new tools. Before you discard your old tools, why not send them to us for our estimate on the cost of renewing them with our Hard Chrome Process?

CENTRAL PNEUMATIC SERVICE, INC.
512 LINDEN AVENUE
DAYTON 3, OHIO
PHONE: CL 2-2701

HARDWOOD FOUNDRY WEDGES

Standard and special sizes made from finest Oak and Hickory, packed in burlap bags. Reasonably priced. Address: Western Wheelbarrow Mfg. Company, (Established 1895) South Fort Smith, Arkansas.

FOR SALE

1—#4 Cupola, with Skip Hoist, Charging Bucket, Charging Car, Cupola Blower and Scales. All for $2,750 as is, where is, at Anniston, Alabama. Near rail siding. Reply Department G, Box 758, Anniston, Alabama.

• FOR SALE

FOR SALE

SPO—#110-J (4) REBUILT
OSBORN—#550 Jolt Pin-Lift
Used less than 60 days.
TOLEDO and FAIRBANKS SCALES—several to select from—send us your needs.
PAYLOADERS (Hough)—¾ Yard REBUILT and GUARANTEED.
PREPARATORS—B & P #60—One *like new*—one older.
TABOR—Jolt Pin-Lift 10" Cylinder—*like new.*
Other good equipment—contact us

W. O. McMAHON
P.O. BOX 5799, HOMEWOOD STATION
BIRMINGHAM 9, ALABAMA
PHONES: TRemont 1-2088 and 9-6170

FOR SALE

One Model 3 Unit Drive Simpson Muller, with Bucket Loader, Double Discharge Hoppers, Mill Belt, Bucket Elevator, National System Aerator, 14 ft. long Prepared Sand Conveyor, 50 ton Sand Storage Bin. All in good condition. Address: Box 642, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

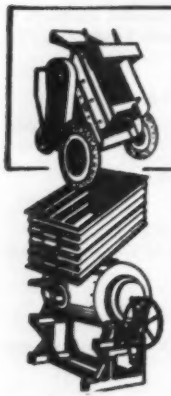
FOR SALE

One Model TSM3-Gr. 16 Shell Process, Inc. gas fired single station shell molding machine in good condition. Address: Box 648, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Use an Inquiry Card

For further information on anything described or advertised in this issue . . . . . .

SEE Page 45



EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC ROAD — CLEVELAND 10, OHIO

CLEANING EQUIPMENT
1—72" Swingout table
1—96" Swingout table
3—6 cu. ft. Continuous Tumblast
1—42" x 48", 17½ cu. ft. Tumblast with loader
1—36" x 42", 11½ cu. ft. Tumblast
1—6' Table Airblast w/six aux. tables
1—5' Table Airblast w/six aux. tables
1—6' Table Pangborn LE

COPE and DRAG UNITS
Automatic Controls
21" squeeze cylinders
1—215 Milwaukee
1—217 Milwaukee
2—TDA-4 Taccone 24"x24"

ELECTRIC FURNACES
1—3000 lb. Heroult Side Charge
1—500 lb. Lectromelt

MULLERS
Simpsons #2, 3, unit drive
Clearfield #404, 610

LADLES-WHITING
4—25 Tons 2—15 Tons 2—10 Tons

CORE OVEN
1—Di-Electric Model M800-A Thermonic, 30 KW

SANDSLINGERS
1—B-P 22" head stationary, R&L arm
1—B-P 19" head stationary, double belt
1—B-P 19" stationary, riddle type

ASK FOR OUR COMPLETE LISTING—CALL GLENVILLE 1-1222

Circle 866 on Page 55

. . . . a trademark to remember . . . . . a name to trust . . . . .

FOUNDRY ENGINEERING SERVICE

FOUNDRY EQUIPMENT BY FOUNDRYMEN

HAMLIN-NAGEL, INCORPORATED

Box 192, EDWARDSVILLE, ILLINOIS, *In Metropolitan St. Louis*, PHONE 3864

SAND SLINGERS

B & P Tractor type, 6' jib, 4' ram arm, 18" head. B & P Stationary, 19" Head

MECHANIZED MOLDING SYSTEM

Link-Belt 14 Station overhead Sand System, includes sand storage, muller, mold roller and pallet conveyors, oscillating shakeout conveyors and sand return

JOLT SQUEEZERS

Osborn 275J
International LJS 10"
International PJS 16"
Tabor Top Squeeze 10"
SPO 110J
Champion 10"
Milwaukee 104-5—10"

JOLT SQUEEZE PIN LIFT

Milwaukee 128 Portable 21 x 27 Table 8" Draw
Milwaukee 145 24 x 30 Table 8" Draw
Osborn 712 18 x 28 Table 6" Draw

SPO 2192 Auto-Cycle 19" Sq. Cyl 30 x 40 Table 12" Draw
International PK18 18" Sq. Cyl 8" Draw 24 x 36 Table

JOLT ROLLOVER DRAW

International "G" 30 x 12
International "F" 45 x 72 x 16" Draw
J&J 815, 30 x 40 x 15" Draw
J&J 918, 40 x 50 x 20" Draw
J&J 612, 25 x 30 x 8" Draw
SPO 508, 28 x 30 x 9" Draw
Tabor 30 x 50 x 12" Draw Shockless

JOLT PIN LIFT

Davenport 34A, 36 x 46 x 12" Draw
J&J 12168, 36 x 54 x 16" Draw
J&J 688, 24 x 30 x 6" Draw
Milwaukee 1536, 32 x 38 x 10" Draw

JOLT SQUEEZE ROLLOVER DRAW

SPO 9546, 30 x 40 Flask 11" Draw
SPO 920, 32 x 44 Flask 11" Draw
Osborn 332, 26 x 36 Flask 9" Draw

PLAIN JOLTERS

J&J 72 x 72

SAND MULLERS

Simpson 18" Lab. Muller
Simpson Porto-muller
Simpson #1½ UD
Simpson #1½ UD w/skip, dust hood, dust collector, areator, water meter
Simpson #2 w/skip (open gear)
Simpson #3UD auto-cycle, dust hood, etc.
B&P 3½ Mulbaro
B&P #60 w or w/o Multromatic
Clearfield 610
Clearfield 920 w/skip
Carver CO_2 Sandmixer 200# cap.

SAND CONDITIONERS

B & P Screenarators, M. L.
50" Molders Friend
Royer NDP, Royer NC2, Royer JR
American Sand Cutter, various sizes
B & P No. 60 Preparator

SHAKEOUTS

Simplicity 3 x 5
Simplicity 4 x 6
Allis Chalmers 4 x 6
Allis Chalmers 8 x 10

CORE BLOWERS

Redford No. 1 and No. 2
Champion, CB15, CB18
Demmler No. 1, 2K, 3E
Demmler IE8O Shooter
Hansberg Shooter
Demmler 103EO w/feeder skip hoist, semi-auto cycle
Ross Vibra—Draws

CORE OVENS

Tower oven, various sizes
Batch type, Core & mold drying, various sizes
Porbeck 162B, 5 drawer double end
Foundry Equipment, single end, 5 drawer

CUPOLAS

Whiting 2½-4-5-6-8-9
Cupola Blowers, various sizes
Modern drop bottom skip hoist charger
Modern swivel charger
Hauck cupola lighter
Series 1000 Bondactor
Cupoliner Model 1500

LADLES AND POURING DEVICES

Modern, Whiting, all sizes plus mixing ladle, electric tilt, cylindrical and lip pour

NON FERROUS FURNACES

#60 to #250 Crucible & Iron Pot Furnaces, stationary and tilt
Lindberg Fisher Electric Induction
Reda 1000# power tilt type reverberatory
Stroman 1600#/hr. reverberatory, 1 station double chamber reverberatory
Eclipse 2000#/1 hr. reverberatory, 2 station dip out

CLEANING EQUIPMENT

48 x 72 American Wheelabrator with skip and dust collector

42 x 48 American Wheelabrator
36 x 42 American Wheelabrator with skip & dust collector
27 x 36 American Wheelabrator with skip & dust collector
20 x 20 Air Blast Sly Barrel
No. 3 Pangborn continuous Wheelabrator with feeder & dust collector
36 x 72 Sly Tumbling Barrel, gearmotor drive

GRINDERS

Marschke 2 x 16
Marschke 2 x 24
U.S. #65, variable speed 24"
Mumert-Dixon Swing 15 HP 3 x 24"
Gardner Surface Grinder 53" dia.
Gardner 36" opposed Wheel Surface grinder

AIR COMPRESSORS

25 H.P. Air Cooled I.R.
100 HP XRB Ingersoll-Rand 2 stage, horizontal
175 HP XRE 2 stage, synchronous motor

AIR HOISTS

Ingersoll-Rand 700#, 1000#, 2000#, 4000#, and 10,000#
Curtis Air Cylinder Hoists

ELECTRIC HOISTS

P & H 500#, 1000#
Comet 500#
Cleveland 1000#
Yale 1000#, 6000#

MATERIAL HANDLING EQUIPMENT

Hough Payloaders HA Models
Hyster Forklift 4000#
Clark Forklift 6000#
Towmotor Forklift 7000#
Baker Electric platform 6000#
D. C. Electric Clamshell 1½ Yard
Clamshell Buckets ¾ & 1 Yard
45" Bolted ECM Magnet
50" Bolted Ohio Magnet
55" Bolted Ohio Magnet

TESTING EQUIPMENT

Sand Testing Equipment
Optical Pyrometer

MACHINE SHOP EQUIPMENT

Cincinnati #118 automatic mill
Betts 52" Vertical Boring Mill, 2 loading arms
Niles Radial Drill 13" x 5' arm
American Radial Drill 14" x 7' arm

MISCELLANEOUS EQUIPMENT

Sprue Cutters
Magnetic Pulleys
Steel Flasks
Slip Flasks, Jackets
500# Print-O-Matic Dial
Fairbanks 4400# Dial 6 x 8 Platform
American Rod Straightener Type F & H

WANTED! GOOD SURPLUS EQUIPMENT . . . . . .

universal MACHINERY AND EQUIPMENT CO.

. . . large enough to serve you, small enough to know you.

1632 North Ninth Street
Reading, Pa., Franklin 3-5103

• AIR COMPRESSORS

25 hp INGERSOLL-RAND water cooled, horizontal
75 hp INGERSOLL-RAND water cooled, horizontal
100 hp WORTHINGTON air cooled, 2 stage

• BLOWERS

CENTRIFUGAL 16 oz. 2 to 5 HP
GE, WILBRAHAM—GREEN FISHER Positive Pressure & Cent., Cupola Blowers

• BLAST CLEANING EQUIPMENT

15" Cont. WHEELABRATOR Tumblast
26" Cont. WHEELABRATOR Tumblast
15" x 20" WHEELABRATOR Tumblast
20" x 27" WHEELABRATOR Tumblast
27" x 36" WHEELABRATOR Tumblast
36" x 42" WHEELABRATOR Tumblast
48" x 42" WHEELABRATOR Tumblast
48" x 48" WHEELABRATOR Tumblast
1-A WHEELABRATOR Multi-table
No. 2 WHEELABRATOR Multi-table
WHEELABRATOR Peening Cabinet
WHEELABRATOR "K" Cabinet
WHEELABRATOR Pipe Cabinet
WHEELABRATOR Sheet Cleaning Machine, 48" wide stock
PANGBORN 8' LF Table
PANGBORN Air Blast Room 5' x 8'
6' LK PANGBORN Table Room
6' LG PANGBORN Table
9' LG PANGBORN Table
DUST COLLECTORS AND SKIP LOADERS AVAILABLE FOR ALL MACHINES

Just received from Gov't storage
48" x 42" & 27" x 36" WHEELABRATORS with skip loaders & dust collectors
LIKE NEW . . . ACT QUICKLY

• CONVEYORS

CARRIER Oscillating, 18" W x 54' L
HEWITT-ROBINS Oscillating, 18" W x 40' L
HEWITT-ROBINS Vibrating, 18" W x 10' L Model VC-1
LINK-BELT, Car type mold, 114 cars, 403' track, car size 18" x 42"
LINK-BELT Oscillating, 18" W x 13' L
SIMPLICITY 17" W x 11' L, Model OA-10-KA Feeder
SIMPLICITY 24" x 10" Feeder w/hopper, Model OA-10-JA2

• CORE BLOWERS

DEMMLER #1, #2, #2A, #3K, #4E
INTERNATIONAL 8S-13
OSBORN #91, #192, #91-10
RANDALL MODEL "A" Bench Type
SAN-BLO #40-P-1, 40# core
TACCONE #4D, 10" Draw Stroke Cyl.

• DUST COLLECTORS

COMPLETE STOCK—both Bag & Wet Types, 1000 to 15000 CFM

• FURNACES

DIRECT ARC MELTING

250 lb. LECTROMELT, Side Charge
500 lb. LECTROMELT, 200 KVA trans.
1000 lb. SWINDELL
2000 lb. HEROULT
2000 lb. SWINDELL, 3/60 1000 KVA
1½ Ton HEROULT
10' Top Charge Furnace

INDIRECT ARC MELTING

10# DETROIT
350# DETROIT LFA
750# DETROIT LFY, Conical Shell
1000# DETROIT AA
3000# DETROIT C, 500 KVA

INDUCTION MELTING & HEATING

30 KW, ECCO Hi-freq. Vacuum Melting
30 KW LEPEL, water cooled spark gap
35 KVA, AJAX 60 cy., alum.
35 KVA, AJAX Spark Gap, High Freq. steel
75 KW TOCCO

GAS & OIL FIRED

1000# HAUSFELD Hand Tilt, Oil fired, alum or magnesium
1—#900 JC STROMAN, gas, Like new
6000# STROMAN, gas fired
20 Gas & Oil Fired Furnaces

HEAT TREATING

4' x 4' x 10' Gas Fired Annealing
9' x 12' Car Type, gas/oil
210 KW LINDBERG conveyor box type
7' Rotary G.E. 200 K.W. 1400° F
36" x 36" West. Pit Type Electric
10" x 12" x 24" LINDBERG, 2500° F. Hyd
42" x 73' G.E. Roller Hearth, 1950° F.
36 x 72, 48 x 120, 48 x 144 gas fired
Large Stock Gas Fired Box Heat Treating Furnaces

• PIT TYPE ANNEALING

42 x 96, 42 x 120 recirculating gas fired

• GRINDERS

DOUBLE END

3 Hp HISEY WOLF 3/60/220
5 Hp U.S. Model 64, 3/60/220
7½ Hp U.S. Model 66, 3/60/440
10 Hp STANDARD 3/60/440
15 Hp MARSCHKE 220 volt
25 Hp KLING 3" dia. shaft

PEDESTAL

3 Hp CLEVELAND 3/60/440
5 Hp CINCINNATI 2/60/440
15 Hp Model Class 1, 3/60/220-440

SWING FRAME

7½ Hp MUMMERT-DIXON 2/60/220-440
10 Hp SAFETY 24" x 3" wheel
15 Hp MARSCHKE 3/60/220-440
15 Hp MUMMERT—DIXON

• LADLES

BOTTOM POUR

MODERN, 49" x 49"
MODERN Crane Type, 55" H x 50" top
MODERN Crane Type, 60" H x 60" top

LIP POUR

WHITING 52" x 52" top dia. geared

CYLINDRICAL

WHITING, 26" L x 25" dia. 1100# iron
WHITING, 19" L x 22" dia. 600# iron
WHITING, 38" L x 28" dia. 2200# iron

• MATERIALS HANDLING

BYERS Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
HOUGH PAYLOADER, Model HA, 1000# cap., hyd. lift, mech. dump

• MOLDING MACHINES

JOLT ROLLOVER PATTERN DRAW

DAVENPORT #348A w/air clamps, 34" x 48" table, 2500#
DAVENPORT #408A, 40" x 60" table, 3000#
HERMAN 10,000# 48" x 109" table
HERMAN 6000#, 42" x 78"
HERMAN 7500#, 40" x 50" table
HERMAN 3000#, 30" x 60" table
HERMAN 3000#, 32" x 70", 15" cyl. series charging conveyor type
HERMAN 1500#, 30" x 48" table
INTERNATIONAL 31" x 16", Type F, 28" x 34" table
INTERNATIONAL 30" x 12", Type G, 28" x 35" table
INTERNATIONAL 13" x 17" table
J & J #918, 40" x 48" table, 18" draw
OSBORN #602, 36" x 26", 900#
OSBORN #405, 3000#, flask 64" x 57"
TABOR 40" x 60", 1500 & 3000#
TABOR 30" x 49" w/air clamps, 1000#
TABOR 22" x 42" pattern draw shockless, portable, 600#
TABOR 20" x 30", w/air clamps, 1000#
TABOR 14" x 16" Rockover 150#
TABOR 40" x 50" table, 3000# capacity

PLAIN JOLT

INTERNATIONAL, 3' x 4' Table, 12" cylinder
TABOR 3' x 4' table

JOLT PIN LIFT

HERMAN #4317, 22" x 30" table
INTERNATIONAL JDP, 1200 x 8", 24" x 26" table, 8" draw, 1200# port.
SPO #305, 750 lb. 20" x 27" table
TABOR 20" x 24" table, 600#

JOLT SQUEEZE PIN LIFT

INTERNATIONAL PKL, 20" x 28" table, 14" sq. 5½" draw
INTERNATIONAL PKL, 18" x 24" table, 12" sq., 5½" draw, stat.
MILWAUKEE #163, 15" x 24" table, 11" sq., 1500#
MILWAUKEE #165, 24" x 30" table, 16" sq., 1700#
NICHOLLS 18-44, 6½" draw.
OSBORN, #7122, #712PJ, 18" x 28" table, 12" sq., 6" draw, stat. & port.
OSBORN #716 PJ, 22" x 34" table 16" sq., 8" draw
SPO #2114P, 21" x 27" table, 600#
SPO #2116, 21" x 27" table, 11" sq., 6" draw

JOLT SQUEEZERS

INTERNATIONAL #12 LJS, 16" x 20"
INTERNATIONAL #10 LJS, 16" x 20"
OSBORN #275J, 16" x 20" table, 400#
SPO #110J, 17" x 20" table 400#
TABOR Squeeze-in Head, 16" x 19" table
TABOR Yoke Type, 18" x 26" table

• MULLERS AND MIXERS

B&P #30 Speedmuller w/skip, 3 cu. ft.
B&P #40 Speedmuller w/skip, 5 cu. ft.
B&P #50 Speedmuller with cooling & multro-matic controls, 7½ cu. ft.
B&P Conventional, SIMPSON type, 87½" Dia., arranged for cooling
SIMPSON, #0, U.D., 3' Dia.
SIMPSON, #1, U.D., 4' dia., 4 cu. ft.
SIMPSON #1½, U.D., 4'6" dia., 6 cu. ft.
SIMPSON #1½, Sep. Dr., 4'6" dia., 6 cu. ft.
SIMPSON #2, enc. gear or open gear, 6' dia., 14 cu. ft.
SIMPSON #3, 8' Dia. Sep. Dr., 30 cu. ft. batch
SIMPSON Porto-Muller, 39½" dia., 250 to 300 lb. sand

• OVENS

COLEMAN, Gas, 2 Comp. and 5 drawers, O.D. 22' x 12' x 10'
GENRICH, Elec. elevator type

• PRESSES

40 Ton FERRACUTE Sprue Cutter 1½" stroke
125 ton R.D. WOOD Down acting, 9" stroke
NIAGARA No. 82 Punch Press

• SAND CONDITIONING

HANDY SANDY Units, Model H87GT
READY SANDY Unit
B&P Nite-Gang
B&P Screenarator, Model "M"
LINK-BELT Revivifier
MOULDER'S FRIEND, 50" cutting reel
ROYER, NC-2, 10-15 tons/hr, 1½ Hp
ROYER, NC-4, 10-15 tons/hr, 1½ Hp
ROYER PREPARATOR, Comb., Model NDC, 25 ton/hr scrap removal, 8' x 8' hopper
ROYERS, NDP, 15-25 tons/hr, 2 Hp

Sand Handling System
NATIONAL ENGINEERING UNIT
Inc.: #1½ Simpson U.D. Muller w/water meter, National Screen Master Preparator, skip bucket loaders, 20"x20' belt conveyor, "Elevator", 2 Moulder's Helpers (4 stations)—1957 unit LIKE NEW — LOW LOW PRICE!

• SAND SLINGERS

B&P Stationary, 2 speed, 19" head, 4" tip with plate feeder
B&P Stationary, Single Speed
B&P Tractor Type, 16" Head
B&P Tractor Type 19" Head

• SHAKEOUTS

2' x 10' HEWITT-ROBINS
3' x 10' SIMPLICITY
4' x 5' SIMPLICITY
4' x 5'6" SIMPLICITY
4' x 6'6" SIMPLICITY
4' x 8' SIMPLICITY
5' x 6' HEWITT-ROBINS
5' x 8' HEWITT-ROBINS

• TESTING MACHINES

100,000 lb. Olsen UNIVERSAL Tensile
3000 Kg Gogan Brinell Testers

• TRANSFORMERS (Furnace)

100 KVA KUHLMAN 13,200, 1/60
250 KVA WESTINGHOUSE 6600, 3/60
300 KVA WAGNER 4600, 1/60
500 KVA KUHLMAN 13,200, 1/60
800 KVA PENNA. 23,000, 3/60
1000 KVA WESTINGHOUSE 23,000, 3/60
1000 KVA G.E. 13,200, 3/60
2000 KVA WESTINGHOUSE 13,200, 3/60
5000 KVA WESTINGHOUSE 2300, 3/60
7500 KVA PENNA, 13,200, 3/60

• TUMBLING BARRELS

SLY 68" x 32" round
SLY 48" x 36" round

• MISCELLANEOUS

BLASTCRETE Model PM-1 Cupola Gun
KANE & ROACH WIRE STRAIGHTENER Model DX-5
FLASKS, CORE PLATES, All Sizes
CLIMAX Model 2-A Wire Straightener
62" Magnet
MOULDER'S Hoppers, Various Sizes

Your DEPENDABLE Foundry Equipment Dealer

DEPENDABLE SERVICE
QUALITY EQUIPMENT
GUARANTEED SAVINGS

PARTIAL LISTING OF EQUIPMENT NOW AVAILABLE — INQUIRIES INVITED

CUPOLA BLOWERS

INGERSOLL RAND

MODEL	C F M	PRESSURE	HP
FS-337	3000	20 oz.	25
FS-365	4500	16 oz.	30
FS-355	6000	16 oz.	40
FS-387	10,200	20 oz.	75
FS-377	10,500	20 oz.	85
FS-565	14,100	40 oz.	200
ROOTS CONNERSVILLE			
RCR	1040	20 oz.	10
RCS	9075	32 oz.	100
SPENCER TURBO			
2025H	1650	32 oz.	25
Cont.	7500	48 oz.	150

PANGBORN LK-6' Dia Table-Room Rotoblast, Max. height of work 36", max. weight on table 5000 #. Table speed 2.4 RPM. Pitless type. New 1952. Serial #61LK-5119.

SAND MULLERS

CLEARFIELD

MODEL	PAN DIA.	CAPACITY
404	4'	400 #
610	6'	1500 #

BEARDSLEY & PIPER

MODEL	CAPACITY	AIR COOLED
20	4 cu. ft.	Yes
30	4 cu. ft.	No
60	12 cu. ft.	Yes
68	12 cu. ft.	No
70	15 cu. ft.	No
80	20 cu. ft.	Yes

ALL CAN BE EQUIPPED WITH DUST HOODS, SKIP HOIST LOADERS, MULTRAMATIC CONTROLS, ETC.

2—B&P #3½ Mullbarco.
1—SIMPSON Porto-Muller.

SIMPSON

MODEL	PAN DIA.	CAPACITY	DRIVE
0	3'	175 #	Sep.
1-H	4'	500 #	UD
1½	4'-6"	700 #	UD
2	6'	1500 #	UD
2	6'	1500 #	Encld.
3	8'	3000 #	UD
3	8'	3000 #	Encld.
3½	9'-3"	5000 #	UD

ALL CAN BE EQUIPPED WITH NATL. ENG. STRAIGHT LIFT SKIP HOIST BUCKET LOADERS.

LANCASTER

MODEL	PAN DIA.	CAPACITY
EA4	59"	9 cu. ft.
EBG-4	89"	9 cu. ft.

JOLT SQUEEZE PIN LIFT MACHINES

MODEL	TABLE SIZE	DRAW	DIA.	CAP.
PKL-12	18" x 24"	5¼"	12"	600 #
PKL-14	20" x 28"	5¼"	14"	1000 #
PK-16	20" x 30"	8"	16"	1700 #
MILWAUKEE				
125	21" x 27"	8"	12"	1200 #
145	24" x 30"	8"	14"	1700 #
195	28" x 39"	10"	19"	3000 #
196	16¾" x 39"	10"	19"	3000 #
244	22" x 32"	12"	24"	3000 #
245	35¼" x 42"	12"	24"	5900 #
246	23¼" x 42"	12"	24"	5900 #
OSBORN				
710-PJ	16" x 25"	6"	10"	500 #
712-PJ	18" x 28"	6"	12"	750 #
714-PJ	20" x 31"	7"	14"	1000 #
716-PJ	22" x 34"	7"	16"	1250 #
SPO				
2114-P	20" x 27"	4"	11"	500 #
2136	21" x 30"	6"	13"	800 #
2146	23" x 31"	6"	14"	1000 #

JOLT SQUEEZE ROLLOVER DRAW

MILWAUKEE

MODEL	TABLE SIZE	DRAW	CYL.	CAP.
167	32" x 33"	12"	16"	1000 #
OSBORN				
332	26" x 36"	9"	16"	750 #
333	32" x 45"	11"	19"	1400 #
SPO				
413-C	24" x 25"	10"	13"	600 #
917-A	26" x 36"	9"	17"	750 #

WHITING 10-TON HYDRO-ARC FURNACE

10' dia. shell, 6'-5" inside depth, 1" steel plate. Cradle tilt, manual & motorized, 9" dia. electrodes. Capacity—15 to 23 tons cupola malleable iron per hour. Holding capacity—16 tons normal, max. 21 tons.
1—ALLIS CHALMERS 2000 KVA Furnace Transformer. 12,000 volt primary, OIWC motor operated tap changer. Entire unit new 1952.

OSCILLATING CONVEYORS

AJAX ENGINEERING (Lo-Veyor)

MODEL	SIZE	CAPACITY in T P H
LC 18-6-24	18" W x 24' L	50
LC 24-6-7	24" W x 7' L	70
LC 24-6-21 FA	24" W x 21' L	70
LC 36-6-9DA	36" W x 9' L	100
LC 36-6-14 DA	36" W x 14' L	100
HEWITT-ROBINS		
VC-6	24" W x 120' L	55
VF-3	30" W x 5' L	12
LINK BELT		
Flexmount	8" W x 70' L	15
SIMPLICITY ENGINEERING		
OA-10-JA	24" W x 13' L	150
OA-10-JA	24" W x 11' L	150
OA-10-JA-2	30" W x 7' L	150
OA-10-JA	30" W x 13' L	100
OA-10-JA	36" W x 6' L	150
OA-10-A	36" W x 10' L	200
OA-10-A	36" W x 16' L	300
OA-10-A	36" W x 25' L	600

SANDSLINGERS

B&P Stationary, Model "DB," 5' jib arm, 4' ram, 19" head, 5" cup, 2-speed, 20/13 HP. Raising & lowering arms or fixed.
B&P Stationary, Model "DB," 8' jib arm, 4' ram, 19" head, 4" tip, 20/16 HP. Raising & lowering arms or fixed.
B&P "Motive Jr.," 11' jib arm, 4' ram, 16" head, 4" cup, R & L arms. 2-speed, 20/13 HP.
B&P "Motive," 15' jib arm, 9' ram, 2-speed, 25/16 HP. With Raising & Lowering

HANDY SANDYS

NEWAYGO SHS-4-G Super Handy Sandys, Single Hopper, 15 cu. ft. capacity, 4' receiving hopper, air gates, 21' center elevator.
NEWAYGO SHS4-GT Super Handy Sandy, Twin Hopper, 25 cu. ft. capacity, 4' receiving hopper, 21' center elevator.
NATIONAL ENGINEERING Moulders Helper, Twin Hopper, 3000 # capacity, each air operated gates.

JOLT PIN LIFT MACHINES

DAVENPORT

MODEL	TABLE SIZE	DRAW	CAP.
34 A-JS	36" x 46"	12"	2500 #
INTERNATIONAL			
JDP 1200x8	24" x 26"	8"	1200 #
JDP 3000x10	48" x 48"	10"	3000 #
JL	32" x 52"	12"	2000 #
JOHNSTON & JENNINGS			
68-SP	25" x 30"	8"	600 #
812-S	30" x 38"	12"	1600 #
MILWAUKEE			
1030	28" x 34"	8"	1000 #
1536	32" x 38"	10"	1500 #
2036	32" x 38"	10"	2000 #
2342	38" x 42"	12"	3000 #
3548-6	44" x 46"	12"	3500 #
OSBORN			
540	32" x 52"	12"	2000 #
560	32" x 45"	12"	2500 #
SPO			
3070	26" x 35"	10"	1500 #

JOLT ROLLOVER PATTERN DRAW

DAVENPORT

MODEL	TABLE SIZE	DRAW	CAP.
24 A	24" x 36"	12"	1600 #
28 A	28" x 40"	12"	1500 #
34 A	34" x 58"	15"	2500 #
48 A	48" x 82"	24"	6000 #

1—INTERNATIONAL Model "AN," Air Clamp, Air Turnover, Air Draw-Molding Machine, 4500 # capacity. Flask—40" width by open ends. Draw 20". New 1952. Used six months.

JOHNSTON & JENNINGS			
612	24" x 30"	12"	600 #
815	30" x 40"	15"	1200 #
918	44" x 54"	20"	2000 #
920-RC	44" x 54"	20"	2000 #
1020-RC	50" x 60"	20"	3000 #
OSBORN			
242-W	29" x 42"	12" to 19"	1500 #
244	35" x 52"	16" to 25"	3000 #
405	57" x 64"	28"	3000 #
442	21" x 31"	10"	600 #
601	24" x 30"	10"	900 #
602	30" x 36"	12"	1200 #
643	36" x 50"	20"	2000 #
SPO			
505	18" x 23"	6¼"	400 #
506	24" x 25"	10"	600 #
TABOR			
MODEL	TABLE SIZE	DRAW	CAP.
22"	22" x 32"	10"	600 #
22"	22" x 42"	10"	800 #
30"	30" x 40"	12"	1000 #
40"	40" x 60"	15"	3000 #

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THE ACME BARGAIN PAGE

AERATOR
NEWAYGO

BLOWERS
I.-R. 12900 cfm, 100 h.p. 220-440 V, 20 oz.
GE 10500 cfm., 20 oz., 85 h.p., 220 V.
GE 7500 cfm., 20 oz., 89.6 h.p., 220-440 V.
SPENCER 7350 cfm., 16 oz., 50 h.p.
GE Centrifugal 6200 cfm., 24 oz., 58 h.p.
6000 cfm. INGERSOLL-RAND 32 oz.
SPENCER 3500 cfm., 28 oz., 40 h.p.
SPENCER 2250 cfm., 16 oz., 15 h.p., 220
SPENCER 1350 cfm., 32 oz.
NORTH AMERICAN 1050 cfm, 16 oz.
NORTH AMERICAN 850 cfm.
500 cfm. NORTH AMERICAN 12 oz.
McKee 200 cfm.

BUCKET ELEVATOR
33' Newaygo 12" x 7" Buckets
28' Newaygo 12" x 7" Buckets

CONVEYOR
17' BARBER GREEN Bucket Conveyor
30" x 25' Magnetic Belt Conveyor w/drives, 2 h.p., 220-440 V.

CONVEYORS, OSCILLATING
24" x 40' Ajax
SIMPLICITY 18" x 24'
SYNTRON 24" x 6'
AJAX 12" x 20'6"
36" x 11', Ajax
8" x 13' Ajax

CORE BLOWERS
CB15 55# cores, Universal blow plate
DEMMLER #4 up to 250# cores
DEMMLER #50
DEMMLER 2EO
DEMMLER 2K
FEDERAL "SAN-BLO" CB 40
INTERNATIONAL SB15H, up to 150# cores. Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
6—OSBORN 193 up to 50# cores
REDFORD #2 & #4

CORE GRINDERS
5—MILWAUKEE 70-9 & 70-12a

CORE OVENS
THERMONIC INDUCTION MODEL 1800A
2—Despatch ET, Drawer Type

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12" draw
SUTTER #500

CRANES
P&H 5 TON Electric Traveling DC motors 50' span
270' Crane Runway and Supports
10 ton MILWAUKEE: 48' span, 220 V.

CUPOLA GUNS
1—Bondactor #1250 and 1000

DUST COLLECTORS
PARSONS 40,000 cfm, cloth bag type
ROTOCLONE W14 Arrang. A. 5200 cfm.

ELECTRIC MELTING FURNACES
1—DETROIT "LFA" 350# shell 13200 V.
1—DETROIT "LFC" 700# and 350# Tapered Shell 2300 V.

FURNACES
400# Fisher Motorized Tilt, Gas Fired
600# Fisher Stationary
600# Campbell Hausfeld Brass

GRINDERS, MISC.
U.S. #70 Comb. 20" disc & 20"x3"x1½" wh
GARDNER 18" single end disc.
HANCHETT 30" double spindle opposed
GARDNER 26" D.E. Disc
Porter Cable BG 8 8" belt
72" Gardner Horizontal Disc
53" Hanchett Horizontal Disc

GRINDERS, SNAG
5—#6 FOX Single Wheel 24" Snag
U.S. #65 D. E. 30" x 3" x 12"
STANDARD 24 x 2½—15 HP DE Snag

GRINDERS, SWING FRAME
FOX 24" x 3" x 12", 15 h.p.
MARSCHKE 24" x 3" x 12" 20 h.p., 220 V.
U.S. 24" x 3" x 12" 15 h.p., 220-440 V.
2—MARSCHKE 3 p.h., 12" wheel
1—B&D 7½ h.p.

CUTOFF SAWS
DEWALT CUTOFF SAWS for ferrous or nonferrous metals, cutoff or as sprue cutters. Flush blade adaptor takes up to 20" abrasive blade or saw. Power Hoist to arm. Chain & sprocket cross feed for working on heavy cast iron 48" x 60" "T" slot table or off table cutting of large work. Motor swivels horizontal to vertical in yoke.

HEAT TREATING FURNACES
G. E. Elevator Type 1950° Atmosphere Generator 65" x 18' car. Electric. Late
G. E. Elevator type 2150°—96" x 144" car atmosphere generator, Electric. Late
LINDBERG 1250° 48 x 60 Electric
3—ABBOTT 24" H x 22" Deep x 30" Wide, Gas Fired
HOLDEN #202 1850° Bright Hardening Annealing
25 KW Westinghouse 2000°

HOISTS
6000# Cleveland, w/monotractor travel
6000# Electrolift
4—2000# R & M
4—CLEVELAND 2000# Cab type hot metal carriers
1—500# Ingersoll-Rand LC-4

INDUCTION MELTING EQUIPMENT
100 KW-Ajax 300# 3000 cycle, 150 h.p. 4 bearings MS set, water cooled, complete controls
30 KW Lepel Spark Gap
35 KW Ajax Tama Wyatt, 60 cycle induction holding furnaces
1000# Ajax Spare Melting Furnaces

LADLES
WHITING 16000# Crane
WHITING 8000# Crane
WHITING 5000# Crane
4000# Industrial Holding

MOLD BLOWER
TACONNE TD4 24" x 32" flask

MOLD CONVEYOR
366'—51—44" x 66" cars

MOLDING MACHINES JOLT SQUEEZE PIN LIFT
8—OSBORN 712 PJ 18" x 28" table
1—CHAMPION J8L10P 18" x 21" table 6" draw
8—MILWAUKEE 2646 Jolt Squeeze Strip rolloff—rolling molding machines 10" jolt cylinder; 1300# capacity, 26" Squeeze cylinder; 13" draw. Flask size 25½" to 29" wide, 52" long. FACTORY REBUILT.
2—MILWAUKEE 165, 24" x 30", 8" draw

JOLT SQUEEZERS
2—CHAMPION, J8l0P 18" x 21" table
2—OSBORN 275PJ
2—MILWAUKEE 244 Jolt Squeeze car type head
MILWAUKEE 181-7, 24" x 36" table
113 PJ SPO
25—124 Milwaukee Portable Jolt Sq.
6—104 Milwaukee Portable Jolt Sq.

JOLT ROLLOVER DRAWS
HERMAN 3000#
2—750# HERMAN 20" x 30" table
1—INTERNATIONAL RJ 20" x 12"
1—SPO 9032
3—SPO 506
1—SPO 506 SP
2—INTERNATIONAL G
2—TABOR 30 x 52

JOLT SQUEEZE ROLLOVER DRAW
OSBORN 331-332-333
SPO 413D
INTERNATIONAL RES.

PLAIN JOLT
36" x 60" Herman

MULLERS and MIXERS
#30 B&P w/skip loader
1—#3 UD Simpson
1—930 Clearfield
CLEARFIELD #404
4—#2 SIMPSON OG
#1 Simpson OG
1½ Simpson Style "C"

SAND CONDITIONERS
AMERICAN 51"
ROYER NDC—ND2
SCREENARATORS S-M-L

SAND SLINGERS & EQUIPMENT
3—19"—2 speed Stationary
2—14' Turntables
1—12' Turntable
4—7' B&P Plate Feeders, 35 & 45 Tons

SAND SYSTEM EQUIPMENT
33' Newaygo Bucket Elevator 12" x 7"
28' Newaygo Bucket Elevator 12" x 7"
4—7' B&P Plate Feeders, 35 & 45 Tons
2—18" x 52' Magnetic Belt

SAWS, BAND
30" LAIDLAW, Metal Cutting hydraulic

SHAKEOUTS
3' x 10' SIMPLICITY
5 x 10 LINK-BELT
4 x 8 LINK-BELT
2' x 8' Double Deck

SHELL EQUIPMENT
SHELL PRODUCTS 20" x 30" pattern size w/shell blender and bonding press
TBM4 Shell Molding Machine 20" x 30"

SHOT BLAST
SLY #4, 20" x 30" w/dust collector

SLAG DISPOSAL UNIT
AMERICAN MODEL A

SPRUE CUTTERS
1—MILWAUKEE #85 TON
OBERMAYER 2 H.P.

STRAIGHTENING PRESS HYDRAULIC
225 ton Southwark
150 ton Farquhar "C" Frame
100 ton Elmes Hydraulic
100 ton Hannifin Hydraulic
60 ton Lempco 4 post
60 ton Farquhar "C" Frame
25 ton Fox
25 ton Dennison

TESTING EQUIPMENT
120,000# YOUNG Universal Tensile

ARLIN Automatic Rockwell, continuous
COLEMAN 55 Spectrophotometer
GOGAN Model 1414-2V
TINIUS OLSON Brinnel Hardness Tester Production Bench

TUMBLING BARRELS
ROTO-FINISH, Model DW 45-36
1—ROYERSFORD, 42" x 72", chain drive
SLY, 24" x 48"; 3 H.P.
SLY, 30" x 60" Duplex

TUMBLING MILLS
30" x 60"

WHEELABRATORS
27" x 36" American w/skip
48" x 48" AMERICAN w/skip
6' Table PANGBORN
#1 Rotary Table, AMERICAN
20" x 27" AMERICAN, w/rubber belt
AMERICAN #2 Tablast 8-28" tables, late
PANGBORN GD1-Airblast Barrel

WOODWORKING—PATTERNSHOP
HERMANCE 24" Planer
JONES SUPERIOR 48" Double Disc
OLIVER #290 Dbl Arbor, Tilt-Arbor Saw
1—OLIVER 182D, 15" Disc Sanders
CRESCENT 24" planer
6", 8", 12", and 30" Jointers
20" Yates American Band Saw
36" American Band Saw

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MOLD CONVEYORS
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10—SPO 113J
BELT CONVEYORS

BUCKET ELEVATORS
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TYPE N ROTOCLONES
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(Illustrated)

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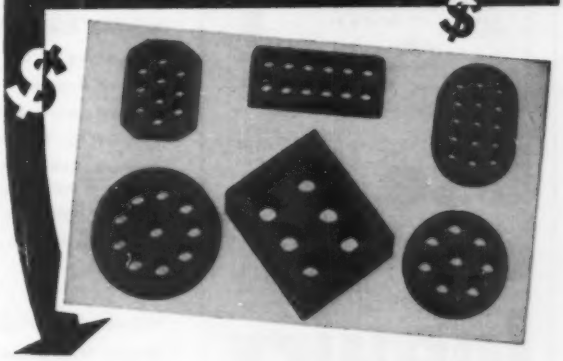

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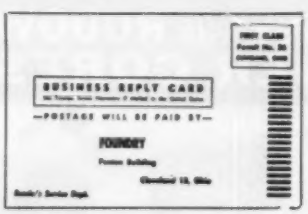

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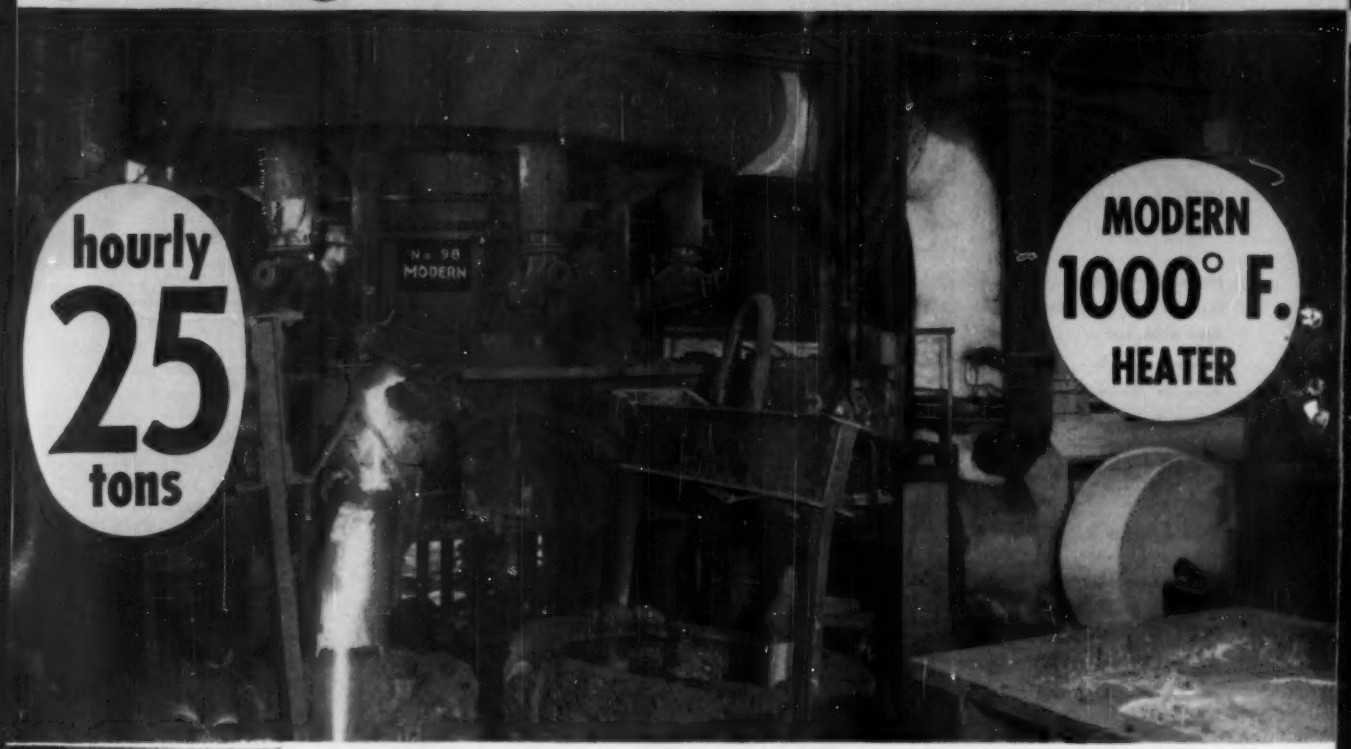
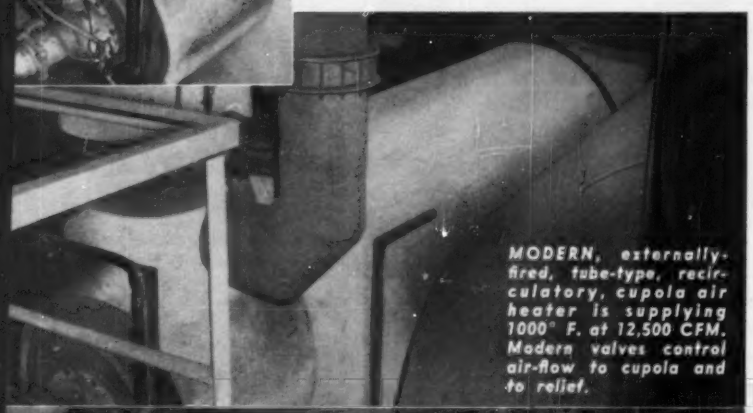


Modern, #96 W-C, water-cooled cupola is 96" dia. in the carbon-lined, offset well. Cupola is fired by 1000° F. Modern heater. Melting progresses continuously; 5 days a week and 24 hours daily.

Nozzle-mix, gas burner of 22 million BTU capacity.

EFFICIENCY BOOSTED BY 1000° F. RECIRCULATORY HEATER . . .

Again, the nation's melting costs are boiling down! NOW, MODERN, economical and highly flexible water-cooled cupolas are fired by new, MODERN, recirculatory, hot-blast heaters:

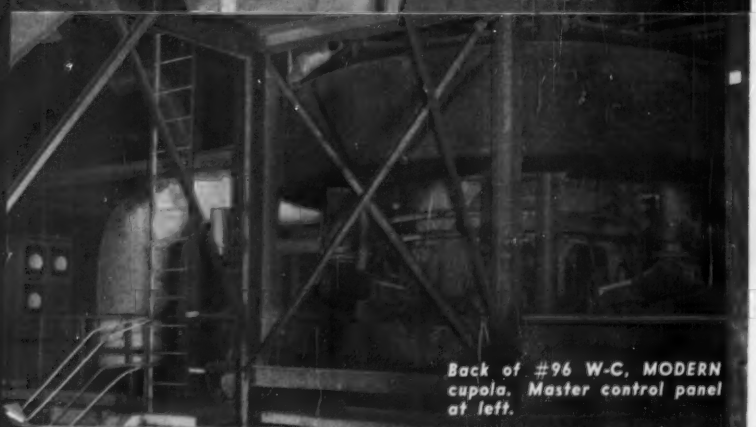


MODERN, externally-fired, tube-type, recirculatory, cupola air heater is supplying 1000° F. at 12,500 CFM. Modern valves control air-flow to cupola and to relief.

Blast air, to 1000° F. and in volumes to 12,500 CFM is helping to cut coke ratios while producing better metal, for ingot-molds, at Vulcan Mold & Iron Company, Lansing, Illinois. Among the major advantages, as gained at Vulcan are:

- Flexibility and fine control over melting processes . . .
- Prolonged periods of melting without dropping bottom . . .
- Decreased costs for coke, refractory and maintenance . . .

Melting, at Vulcan Mold & Iron Company, progresses continuously from Monday morning until Friday night. All these and other benefits are covered in new bulletin 149-A.



Back of #96 W-C, MODERN cupola. Master control panel at left.

MODERN

DEPT. F-12

MODERN EQUIPMENT COMPANY

Port Washington, Wisconsin

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See for yourself how the

NEW STEVENS MULLER CUTS FOUNDRY COSTS!

- *Fast efficient batch mixing*
- *Easiest loading and unloading*

LOOK AT THESE FOUNDRY-PROVED FEATURES!

IT'S FAST—thoroughly mixes a uniform batch in less than two minutes.

IT'S COMPACT—occupies only seven square feet of floor space.

IT'S ECONOMICAL—initial cost and maintenance requirements are low.

IT'S CONVENIENT—four-foot height permits easy hand loading. Unique overhang design allows fast discharge and easy accessibility.

IT'S RUGGED—field-tested to give extra-long, trouble-free service life.

IT'S VERSATILE—provides superior performance with all types of binders.

Write today for complete information on this remarkable, new foundry equipment. It's available for immediate delivery. Remember, too, that Stevens is your best source for all your foundry facings, equipment and supplies.

EVERYTHING FOR THE FOUNDRY

frederic b. **STEVENS, inc.**

DETROIT 16, MICH.

BUFFALO CHICAGO DETROIT CLEVELAND
INDIANAPOLIS MILWAUKEE NEW HAVEN SPRINGFIELD (OHIO)

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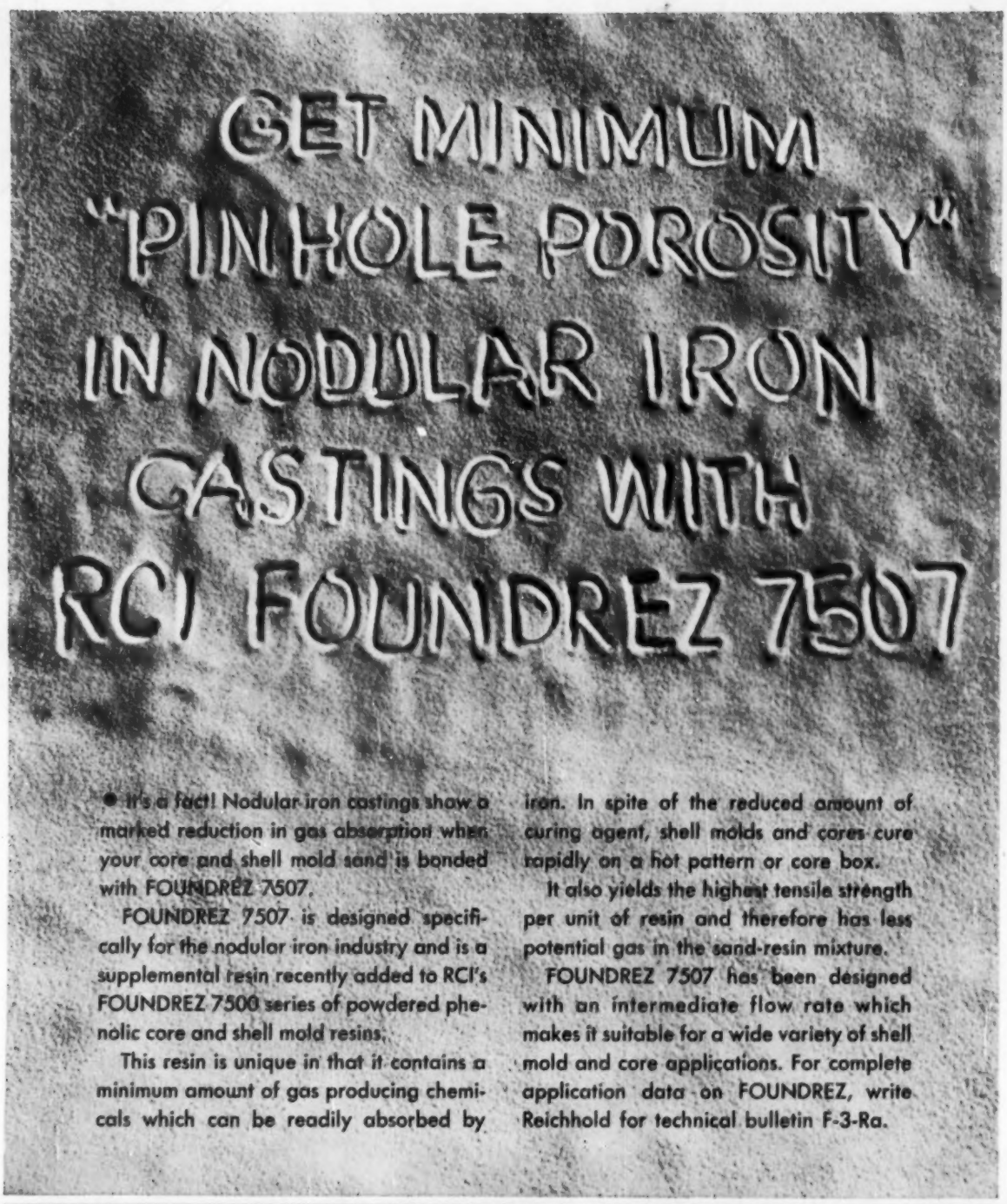

● It's a fact! Nodular iron castings show a marked reduction in gas absorption when your core and shell mold sand is bonded with FOUNDREZ 7507.

FOUNDREZ 7507 is designed specifically for the nodular iron industry and is a supplemental resin recently added to RCI's FOUNDREZ 7500 series of powdered phenolic core and shell mold resins.

This resin is unique in that it contains a minimum amount of gas producing chemicals which can be readily absorbed by iron. In spite of the reduced amount of curing agent, shell molds and cores cure rapidly on a hot pattern or core box.

It also yields the highest tensile strength per unit of resin and therefore has less potential gas in the sand-resin mixture.

FOUNDREZ 7507 has been designed with an intermediate flow rate which makes it suitable for a wide variety of shell mold and core applications. For complete application data on FOUNDREZ, write Reichhold for technical bulletin F-3-Ra.

Creative Chemistry... Your Partner in Progress

RCI

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FOUNDRY PRODUCTS

FOUNDREZ — Synthetic Resin Binders
COROVIT — Self-curing Binders • coRCIment — Core Oils
REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N. Y.

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